FIG.1

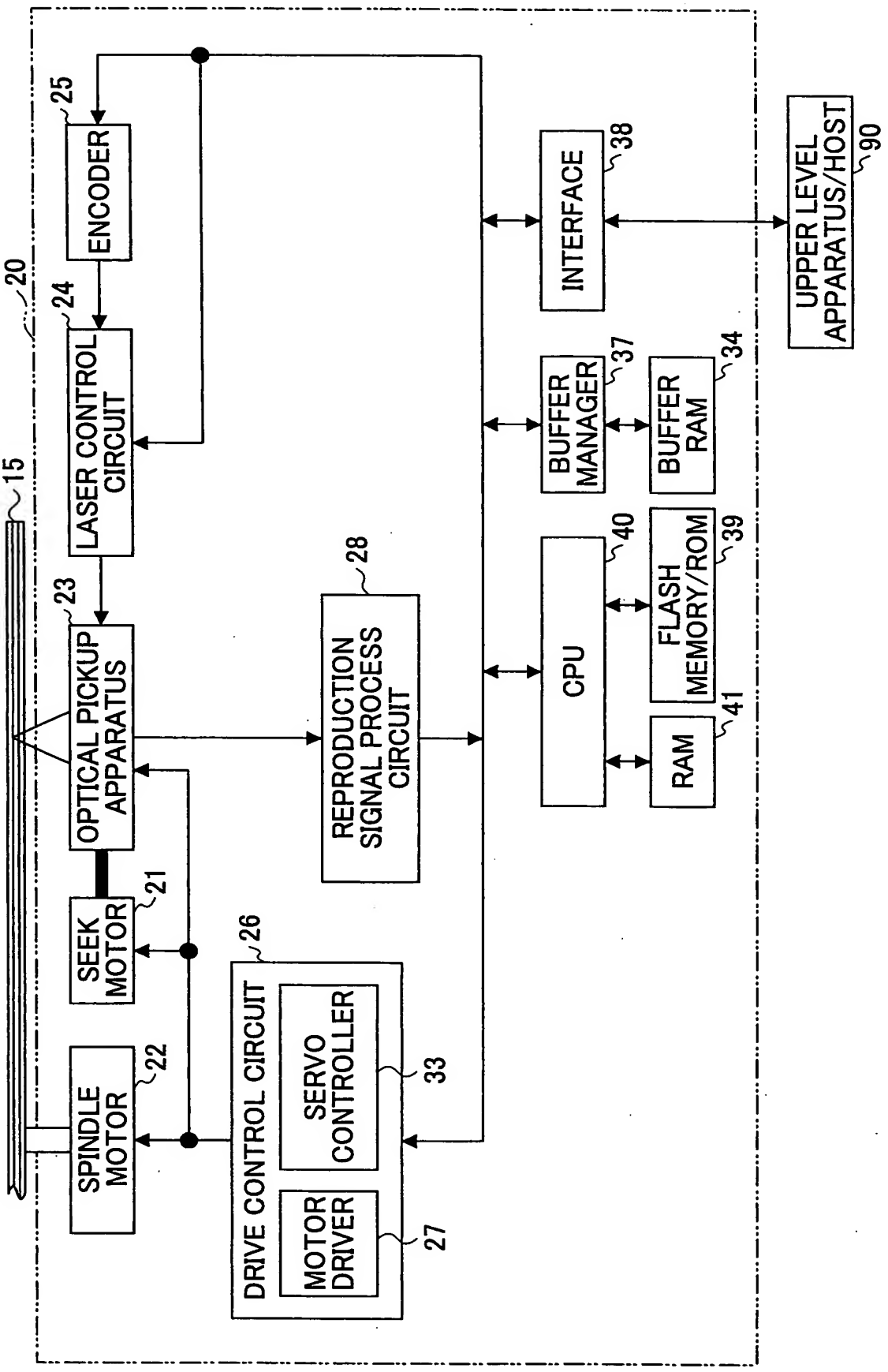
20
15
25
ENCODER
24
LASER CONTROL CIRCUIT
23
OPTICAL PICKUP APPARATUS
21
SEEK MOTOR
22
SPINDLE MOTOR
26
DRIVE CONTROL CIRCUIT
SERVO CONTROLLER
33
MOTOR DRIVER
27
28
REPRODUCTION SIGNAL PROCESS CIRCUIT
INTERFACE
38
BUFFER MANAGER
37
BUFFER RAM
34
CPU
40
FLASH MEMORY/ROM
39
RAM
41
UPPER LEVEL APPARATUS/HOST
90

FIG.2

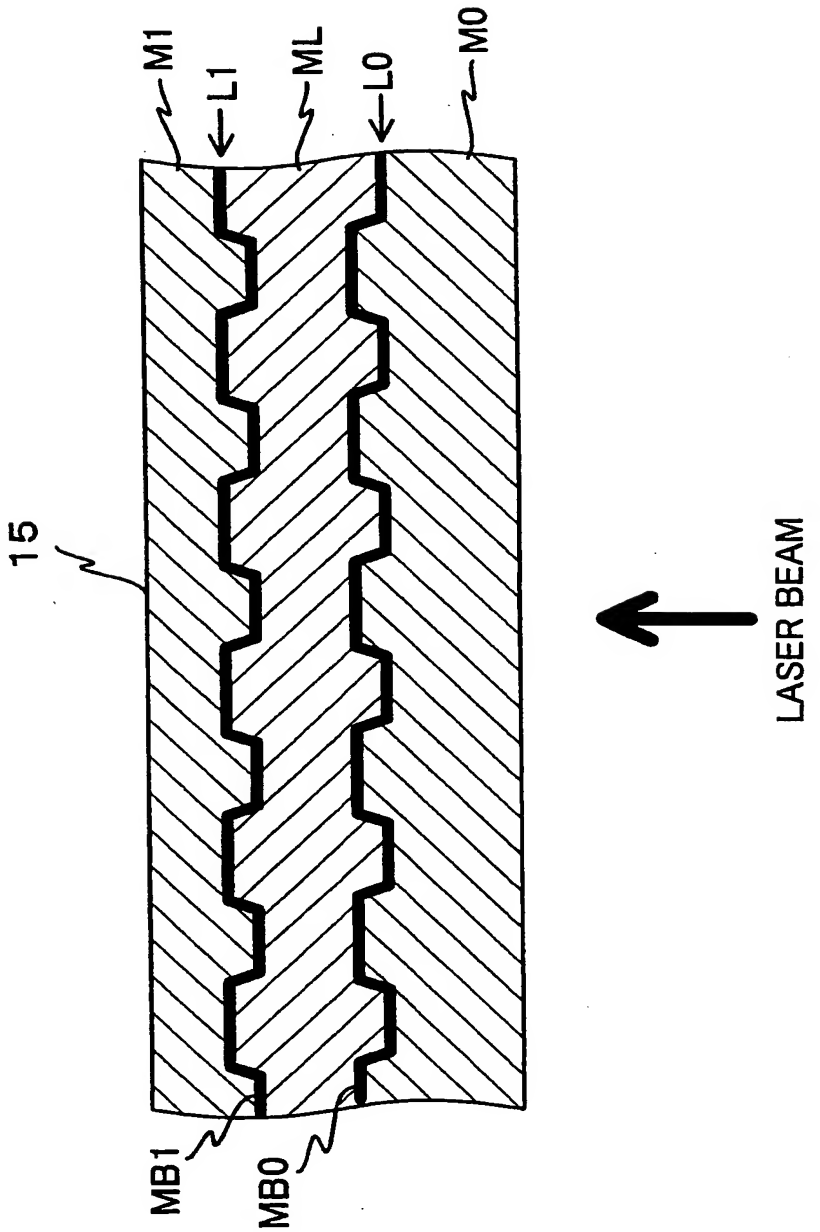

FIG.3A

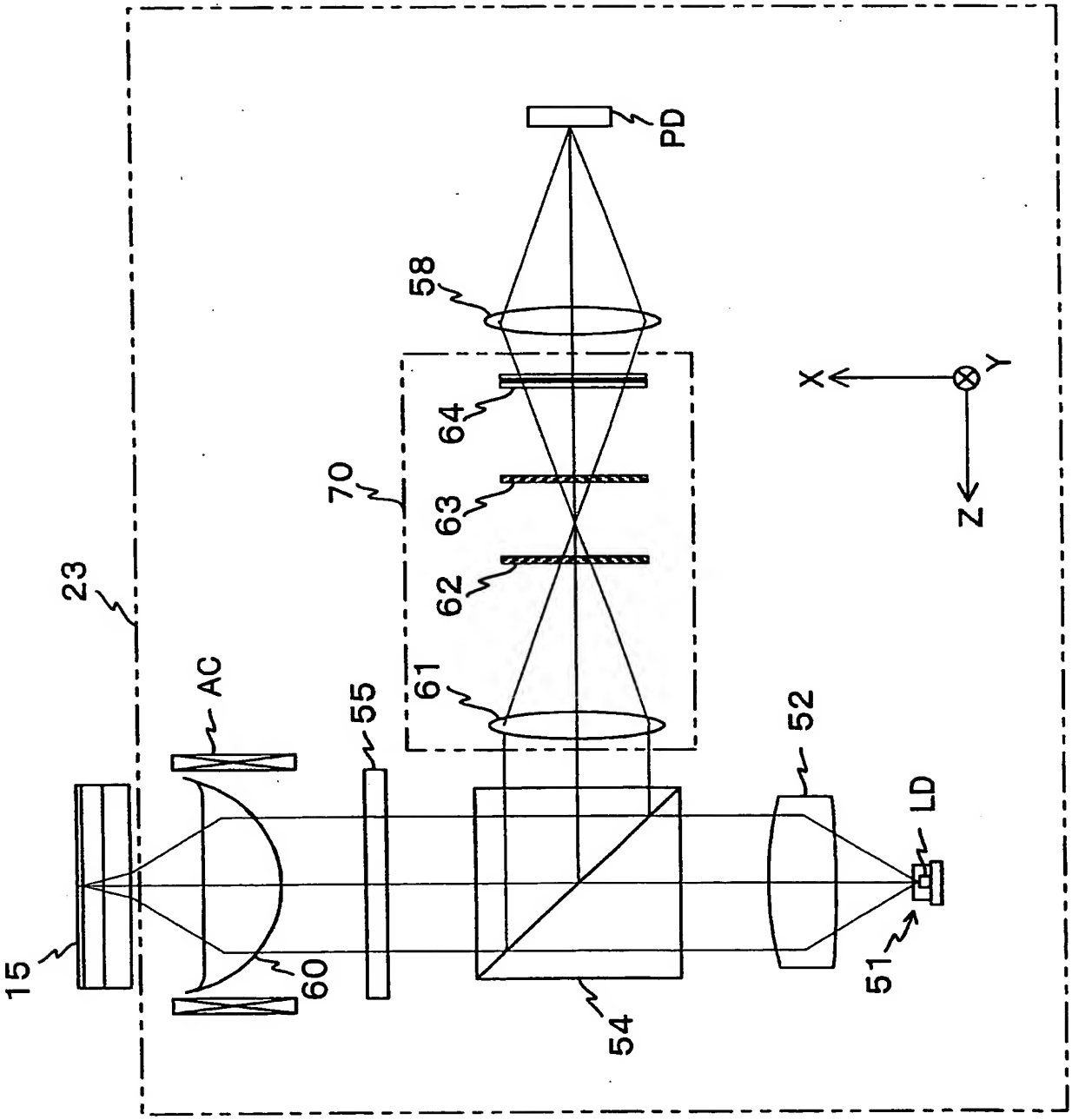

FIG.3B

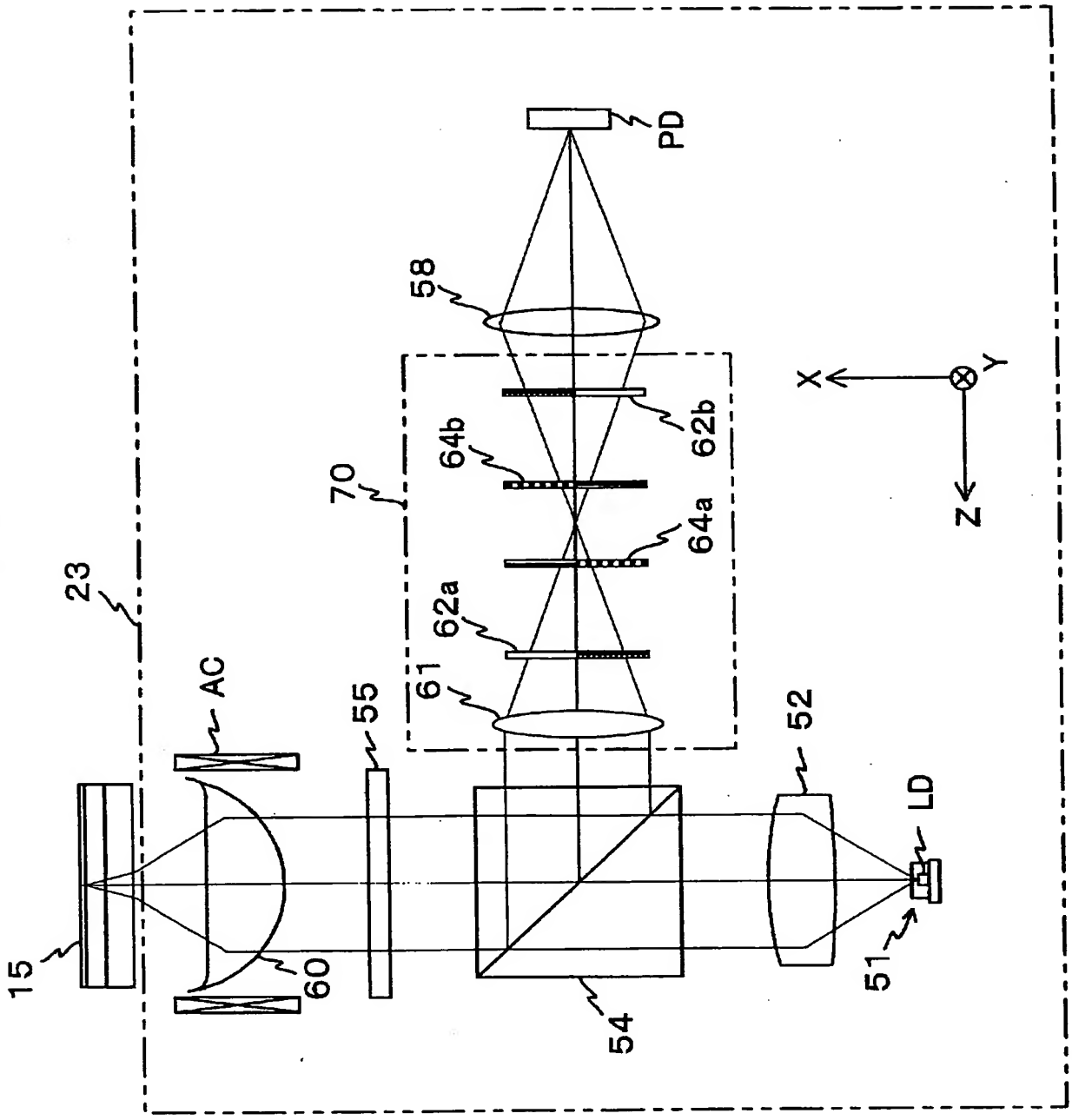

FIG.4A

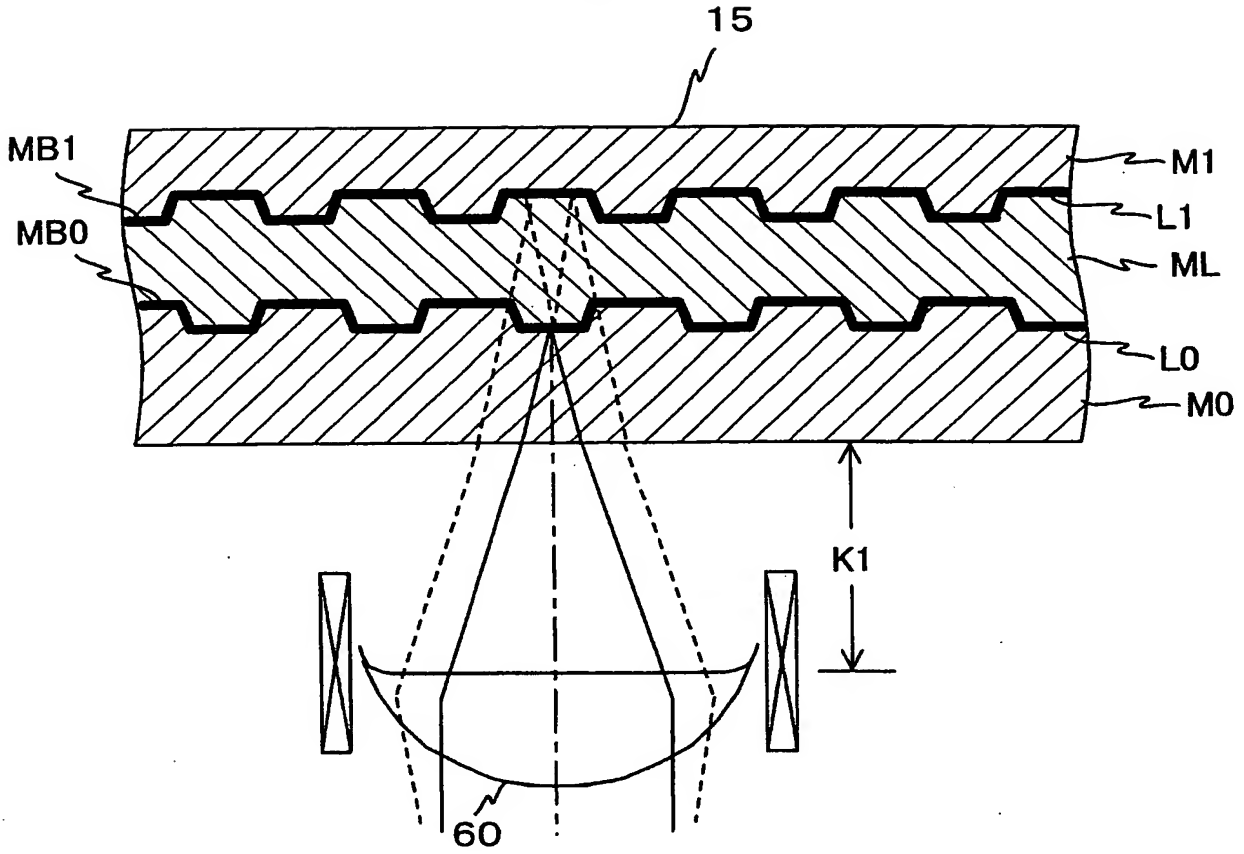

FIG.4B

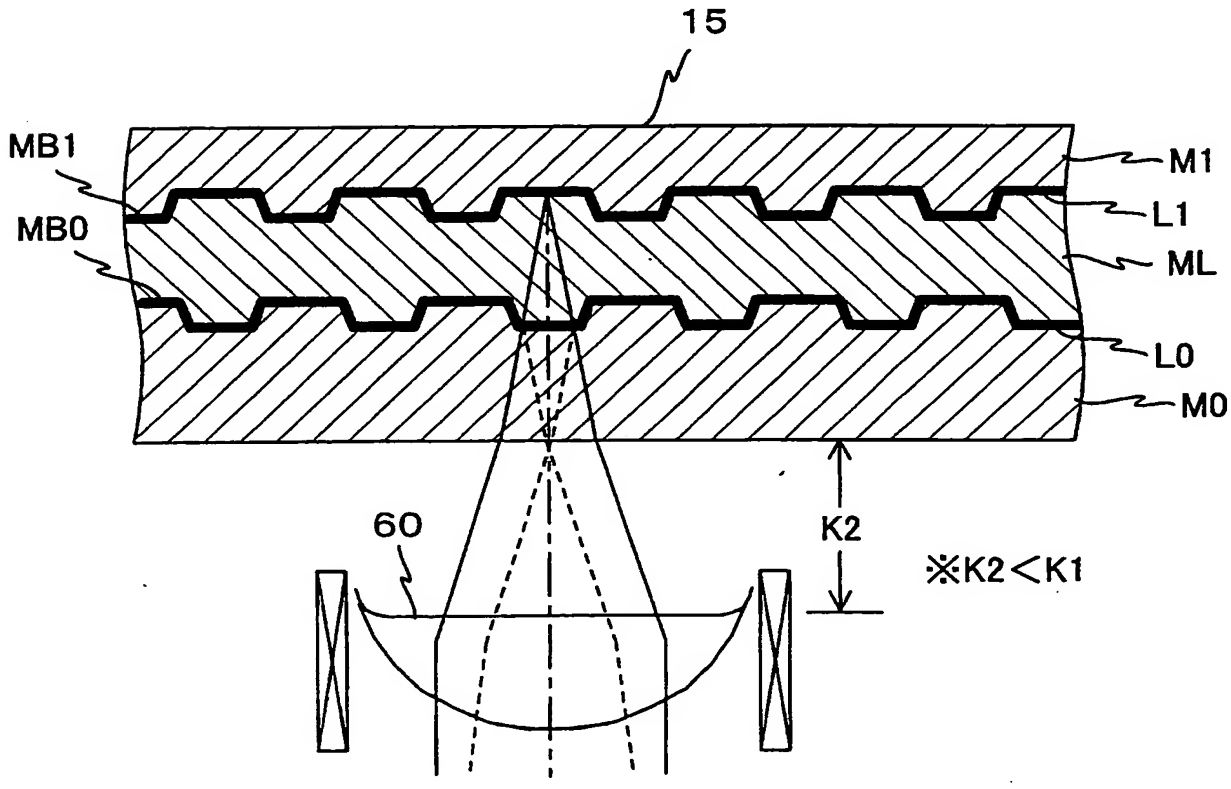

FIG.5A

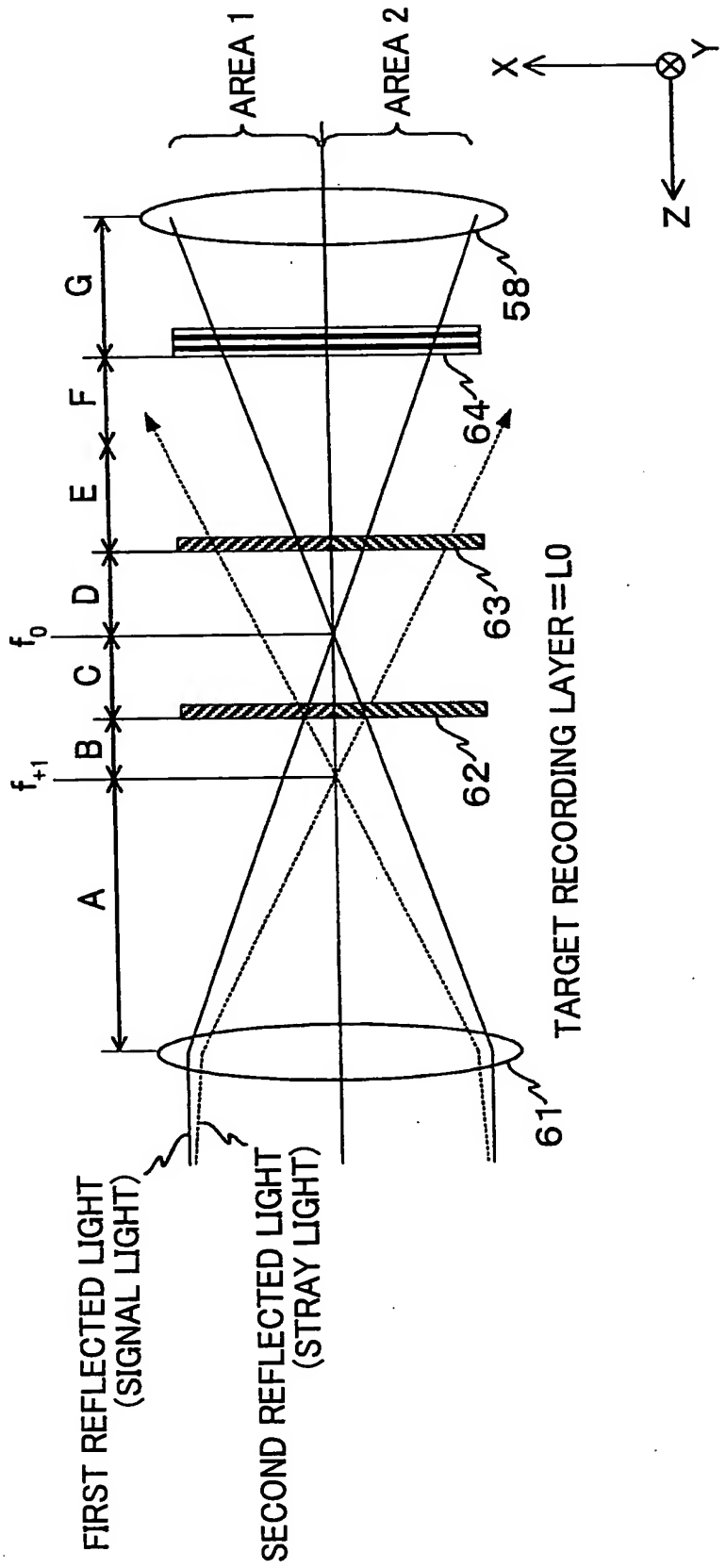
AREA 1
AREA 2
X
Y
Z
G
F
E
D
C
B
A
f_0
f_{+1}
58
64
63
62
61
TARGET RECORDING LAYER=L0
FIRST REFLECTED LIGHT (SIGNAL LIGHT)
SECOND REFLECTED LIGHT (STRAY LIGHT)

FIG.5B

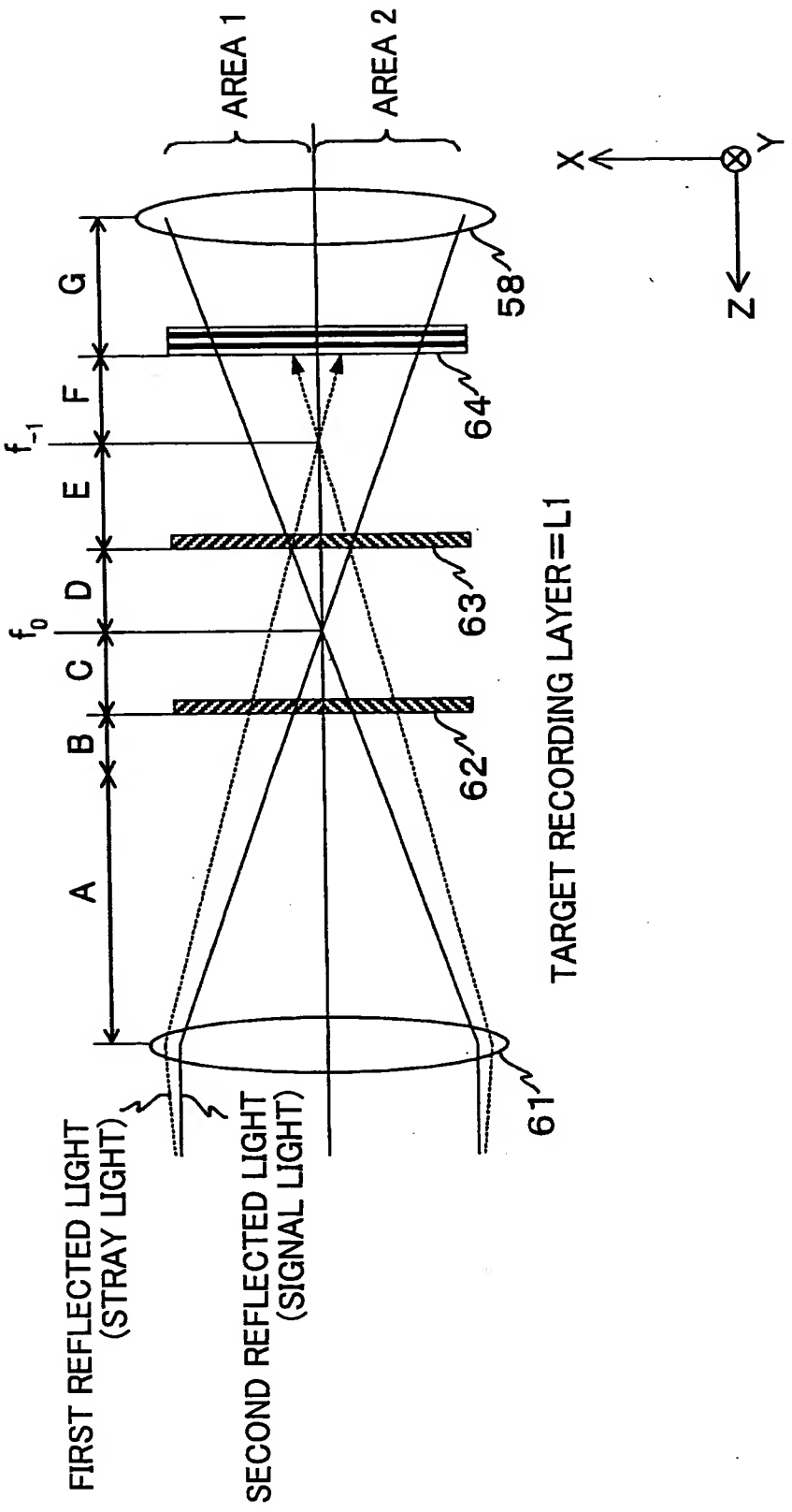
AREA 1
AREA 2
X
Y
Z
58
64
63
62
61
G
F
E
D
C
B
A
f_{-1}
f_0
TARGET RECORDING LAYER=L1
FIRST REFLECTED LIGHT (STRAY LIGHT)
SECOND REFLECTED LIGHT (SIGNAL LIGHT)

FIG.5C

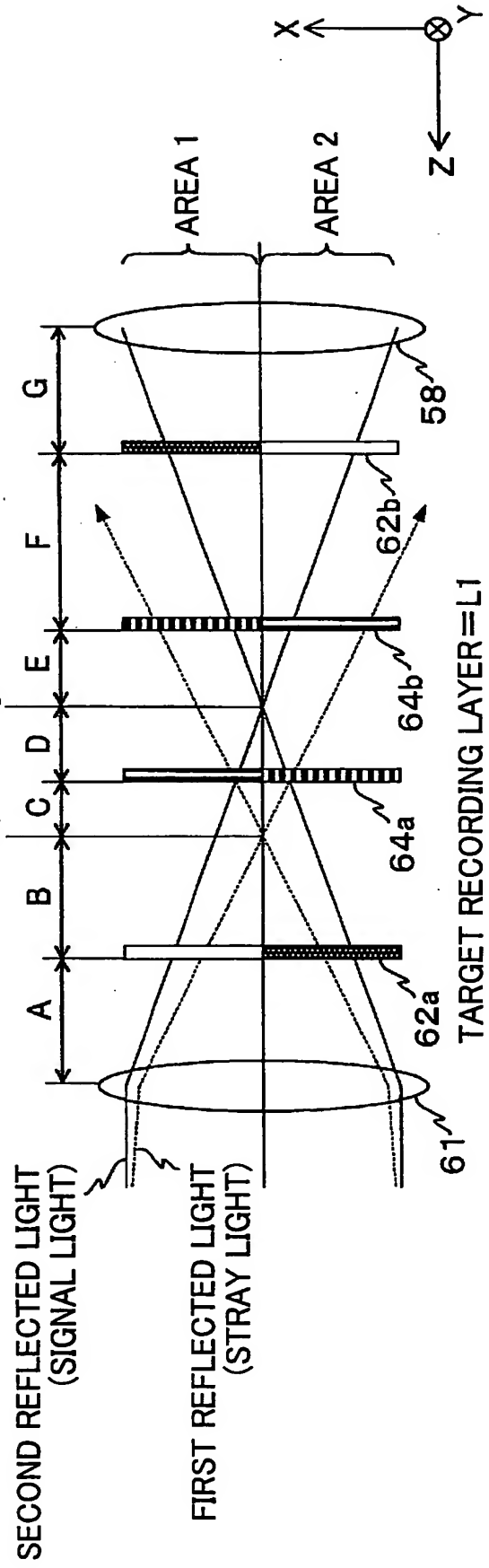
X
Y
Z
AREA 1
AREA 2
58
62b
64b
64a
62a
61
TARGET RECORDING LAYER=L1
SECOND REFLECTED LIGHT (SIGNAL LIGHT)
FIRST REFLECTED LIGHT (STRAY LIGHT)
A
B
C
D
E
F
G
f_{+1}
f_0

FIG.5D

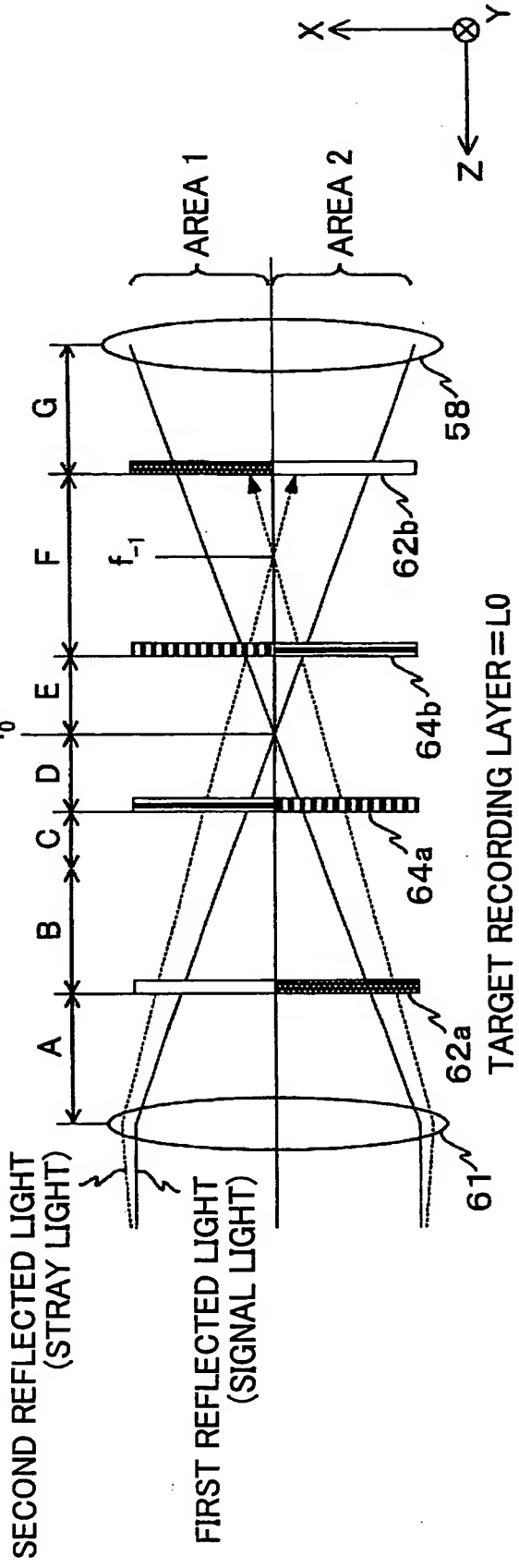
X
Y
Z
AREA 1
AREA 2
58
G
F
E
D
C
B
A
f_{-1}
f_0
62b
64b
64a
62a
61
TARGET RECORDING LAYER=L0
SECOND REFLECTED LIGHT (STRAY LIGHT)
FIRST REFLECTED LIGHT (SIGNAL LIGHT)

FIG.6C

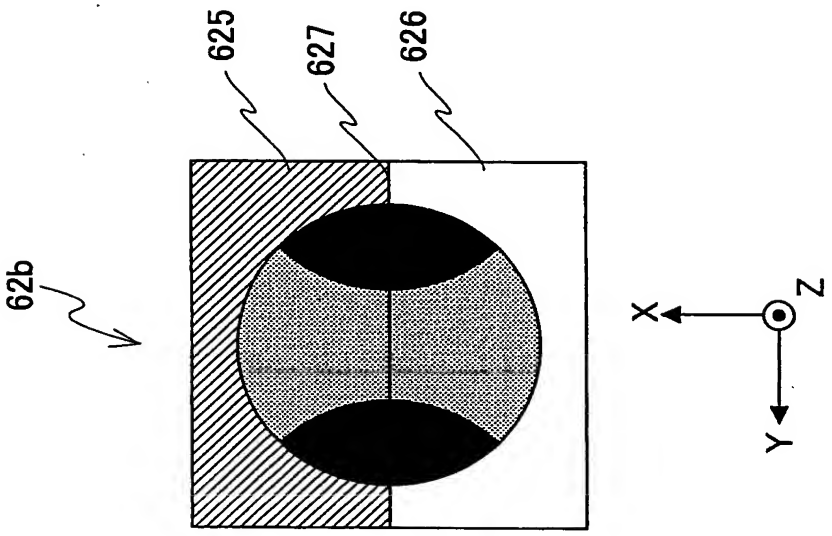

FIG.6B

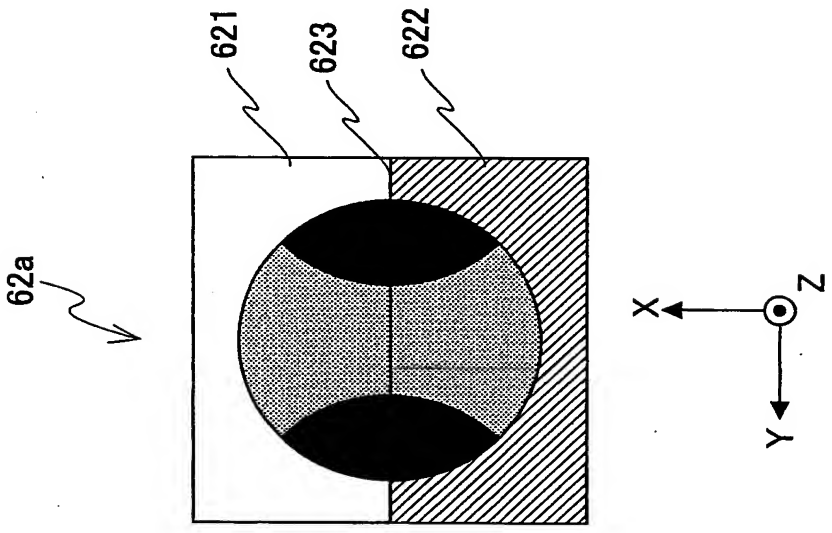

FIG.6A

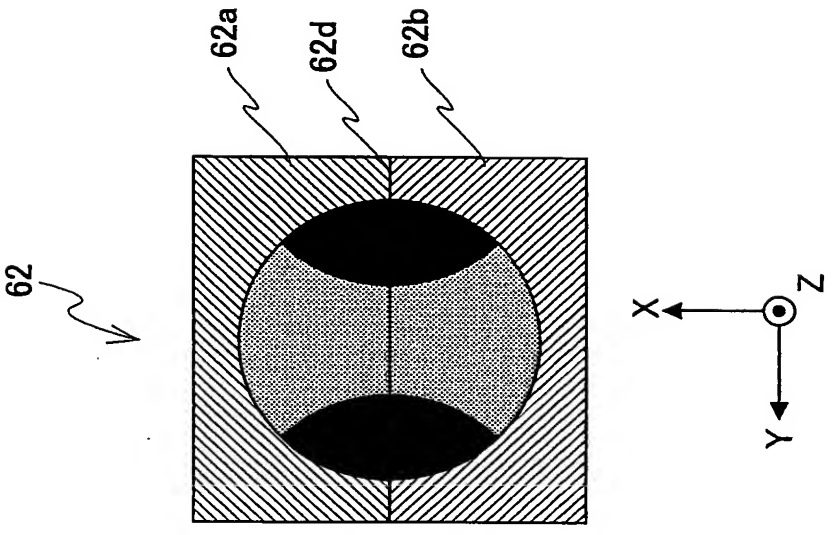

FIG.7C

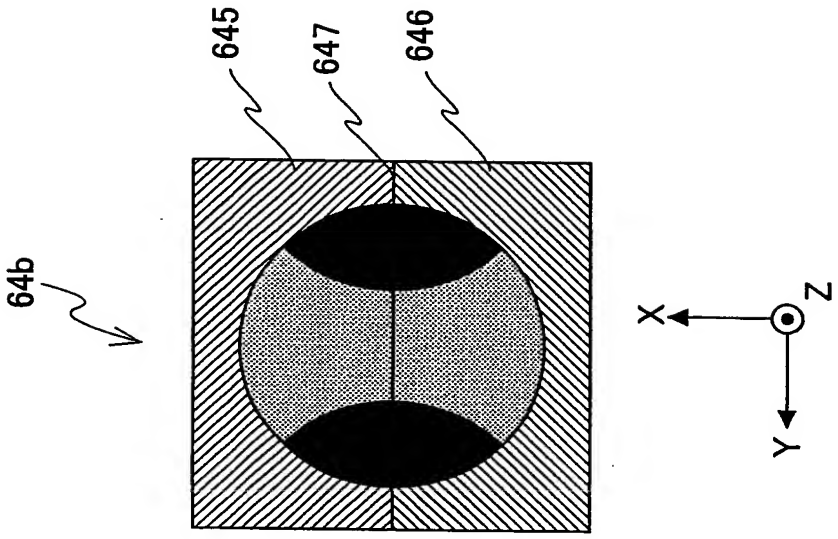

FIG.7B

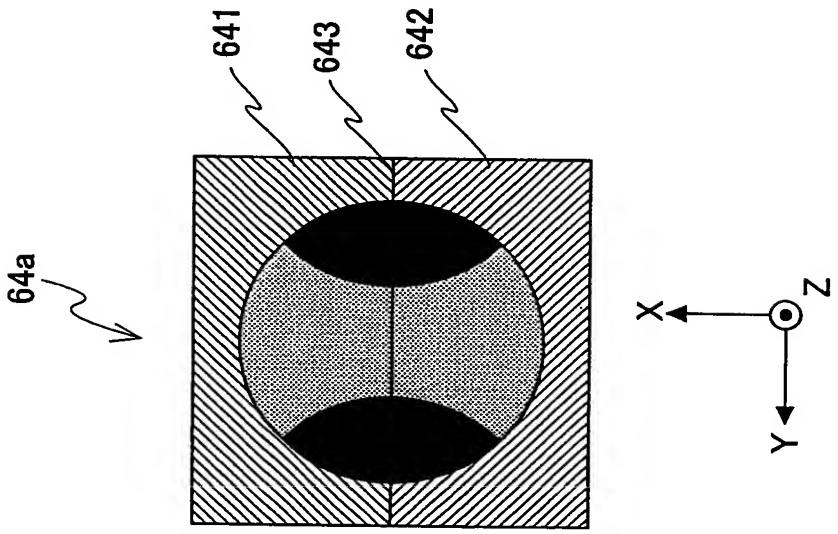

FIG.7A

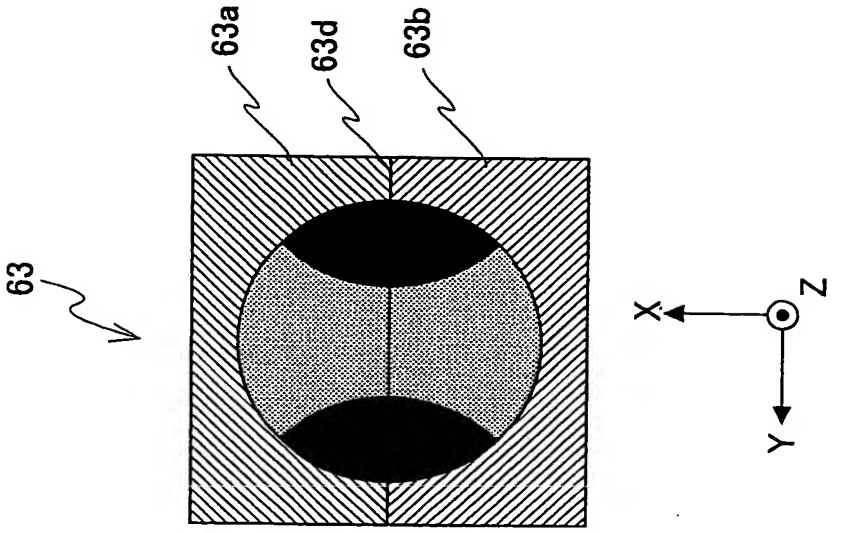

FIG.8A

TARGET RECORDING LAYER	BEAM		OPTICAL PATH						
			A	B	C	D	E	F	G
FIRST RECORDING LAYER	FIRST REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	R	L	S	S	S
		AREA 2	S	S	L	R	S	S	S
	SECOND REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	R	R	P	P	—
		AREA 2	S	S	L	L	P	P	—
SECOND RECORDING LAYER	FIRST REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	R	R	P	P	—
		AREA 2	S	S	L	L	P	P	—
	SECOND REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	R	L	S	S	S
		AREA 2	S	S	L	R	S	S	S

FIG.8B

TARGET RECORDING LAYER	BEAM		OPTICAL PATH						
			A	B	C	D	E	F	G
FIRST RECORDING LAYER	FIRST REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	S	S	P	P	S
		AREA 2	S	P	P	P	S	S	S
	SECOND REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	S	S	S	—	—
		AREA 2	S	P	P	P	P	—	—
SECOND RECORDING LAYER	FIRST REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	P	—	—	—	—
		AREA 2	S	P	S	—	—	—	—
	SECOND REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	S	S	P	P	S
		AREA 2	S	P	P	P	S	S	S

FIG.9A

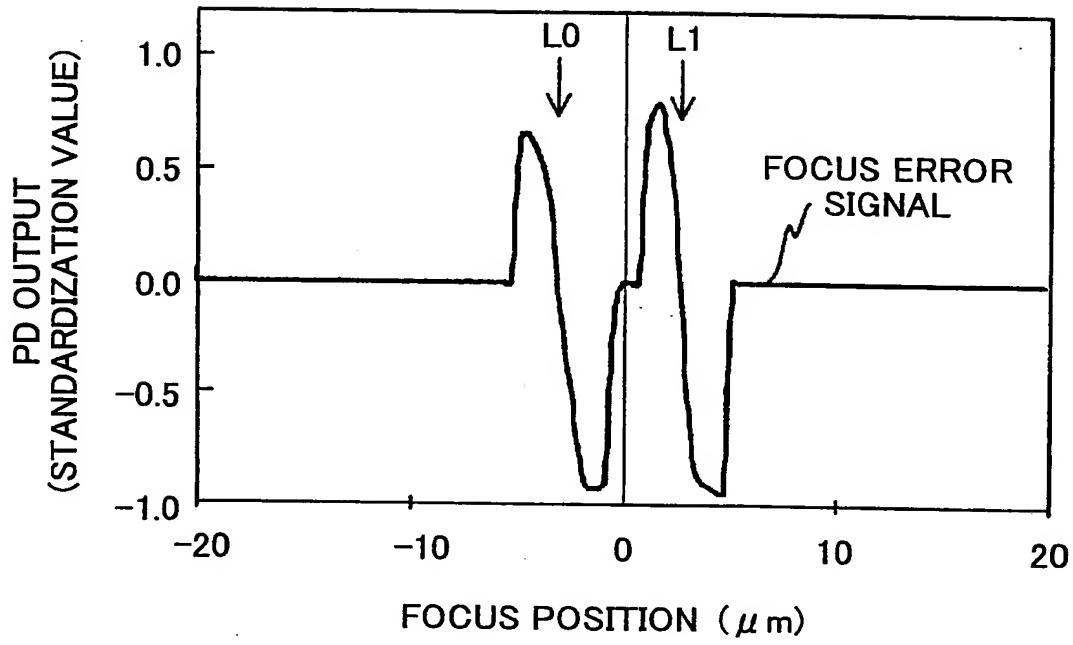
L0
L1
FOCUS ERROR SIGNAL
PD OUTPUT (STANDARDIZATION VALUE)
1.0
0.5
0.0
−0.5
−1.0
−20
−10
0
10
20
FOCUS POSITION (μm)

FIG.9B

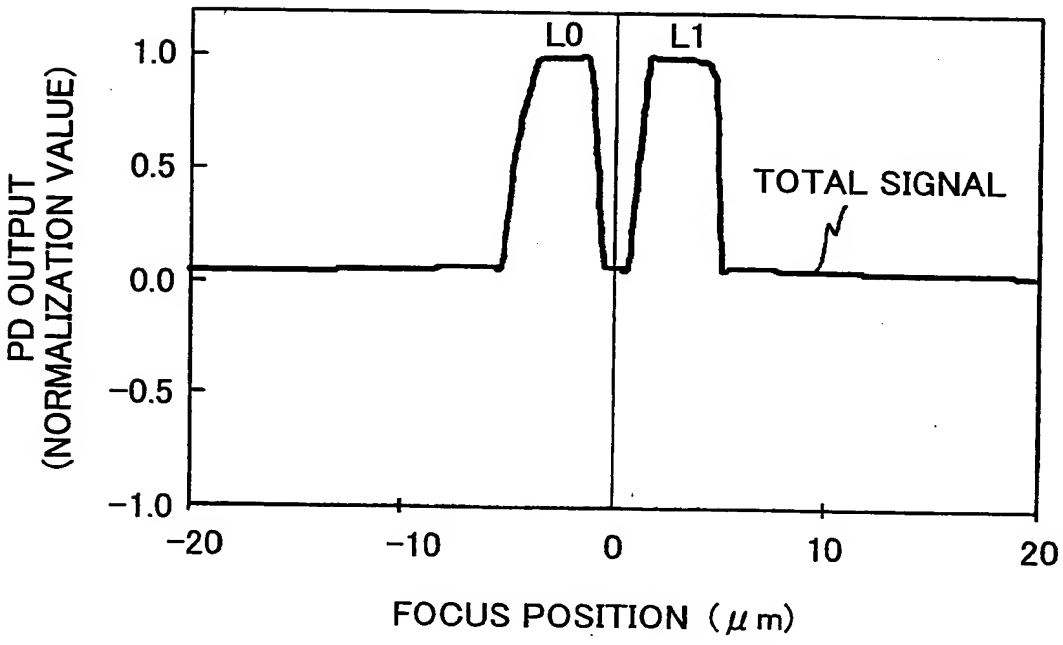
L0
L1
TOTAL SIGNAL
PD OUTPUT (NORMALIZATION VALUE)
1.0
0.5
0.0
−0.5
−1.0
−20
−10
0
10
20
FOCUS POSITION (μm)

FIG.10A

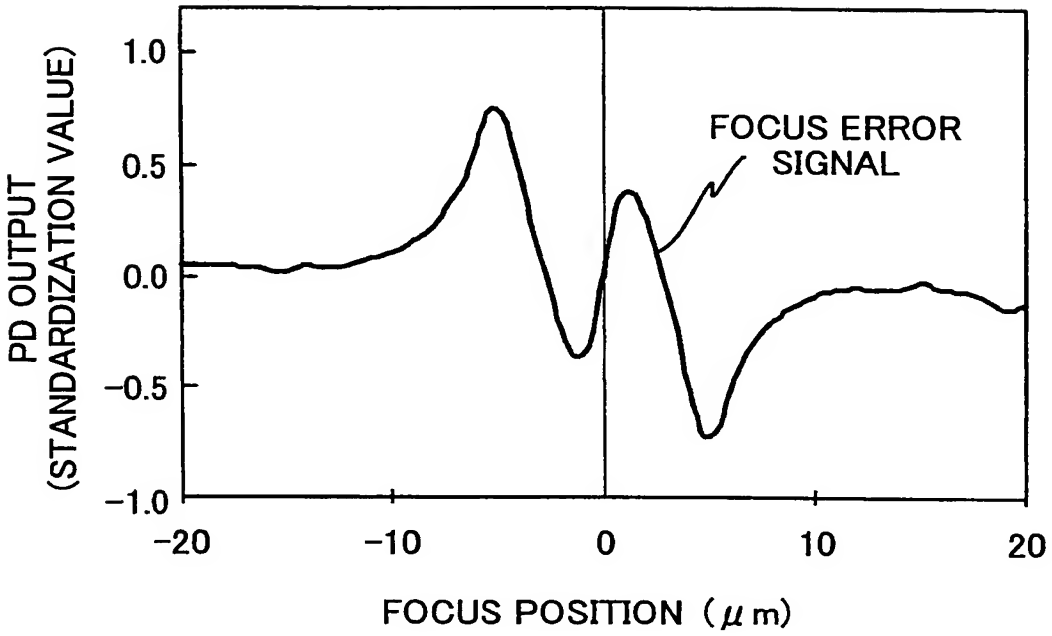

FIG.10B

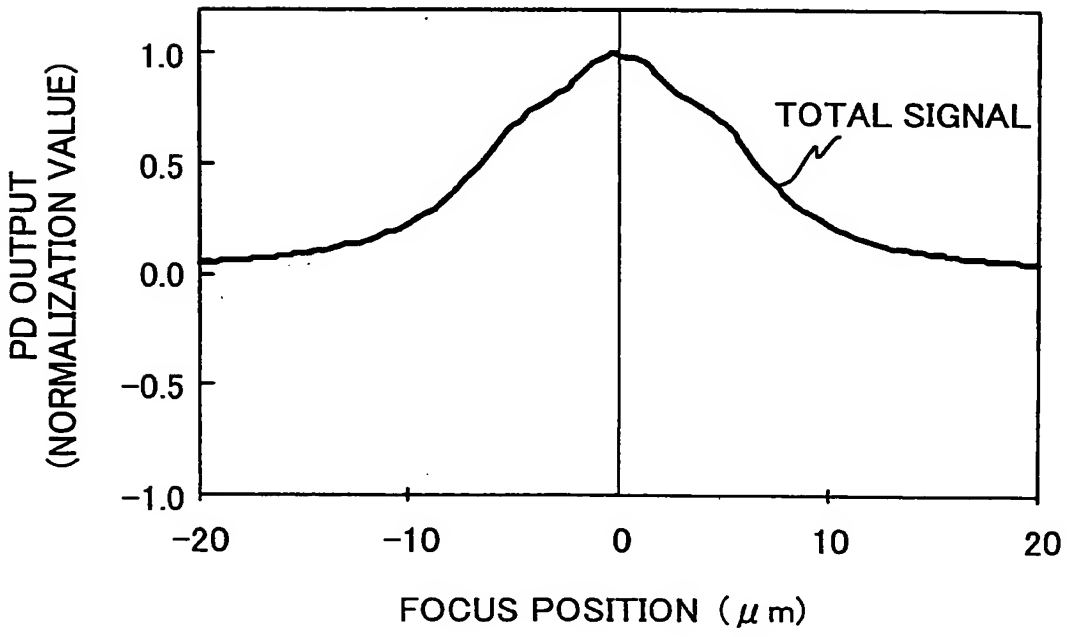

FIG.11

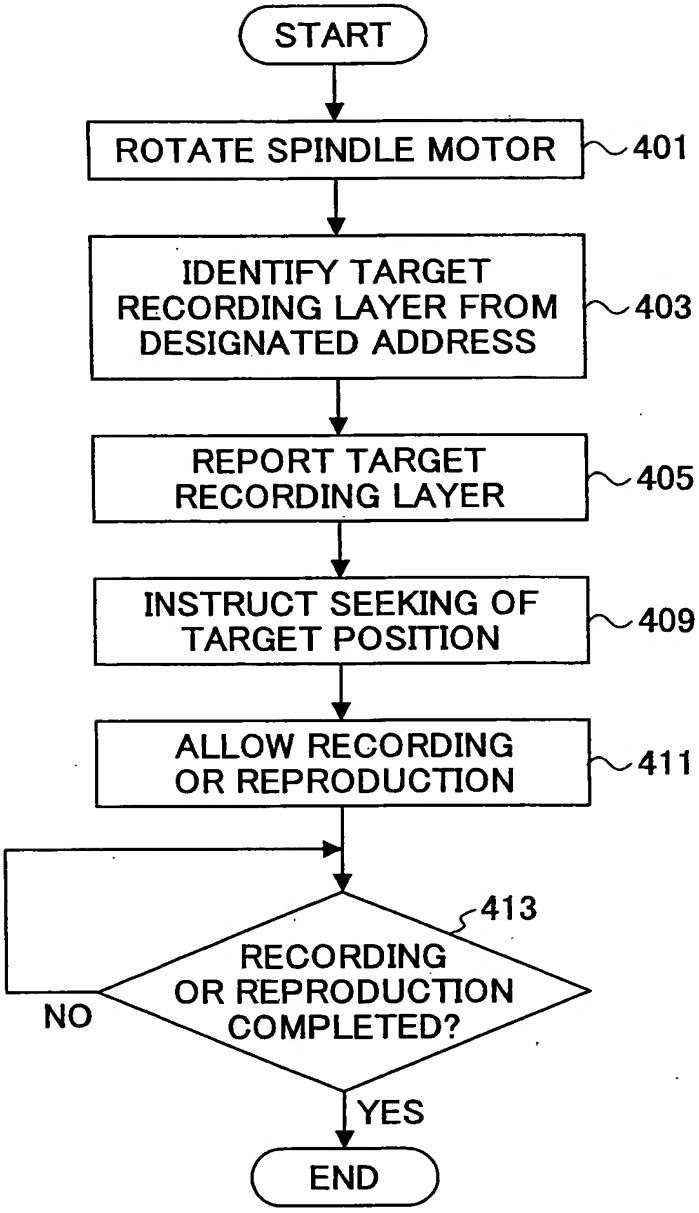
START
ROTATE SPINDLE MOTOR
401
IDENTIFY TARGET RECORDING LAYER FROM DESIGNATED ADDRESS
403
REPORT TARGET RECORDING LAYER
405
INSTRUCT SEEKING OF TARGET POSITION
409
ALLOW RECORDING OR REPRODUCTION
411
413
RECORDING OR REPRODUCTION COMPLETED?
NO
YES
END

FIG.12A

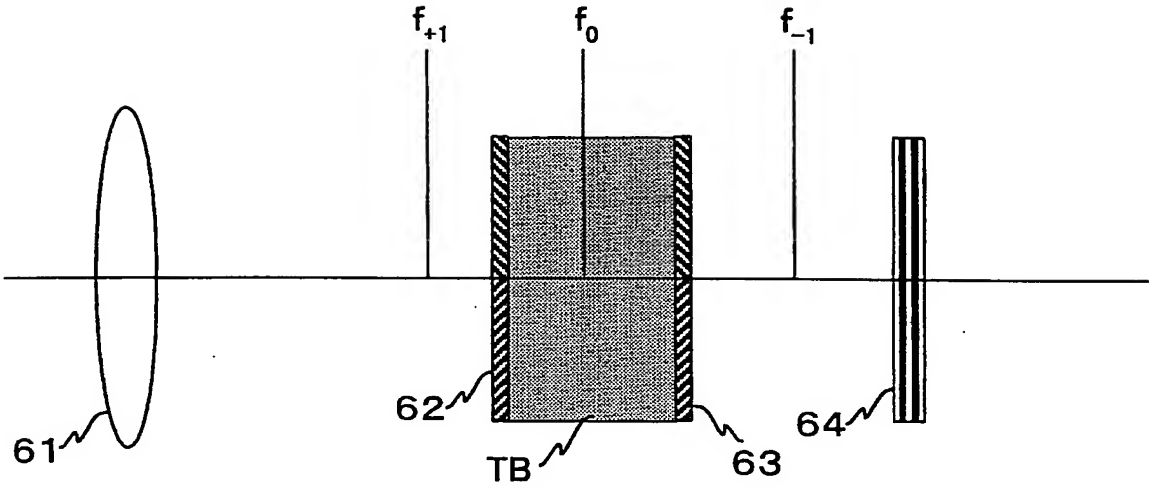

FIG.12B

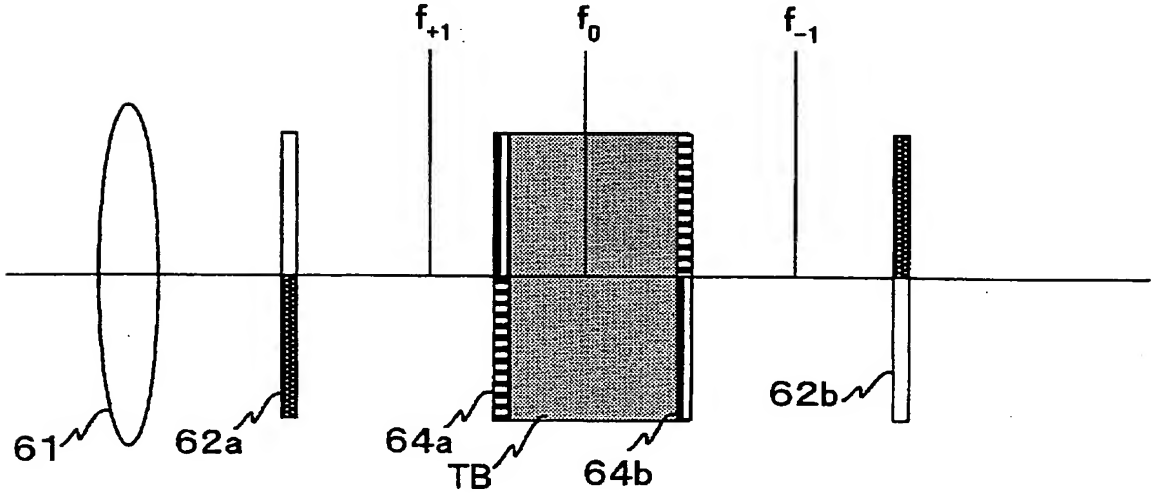

FIG.13A

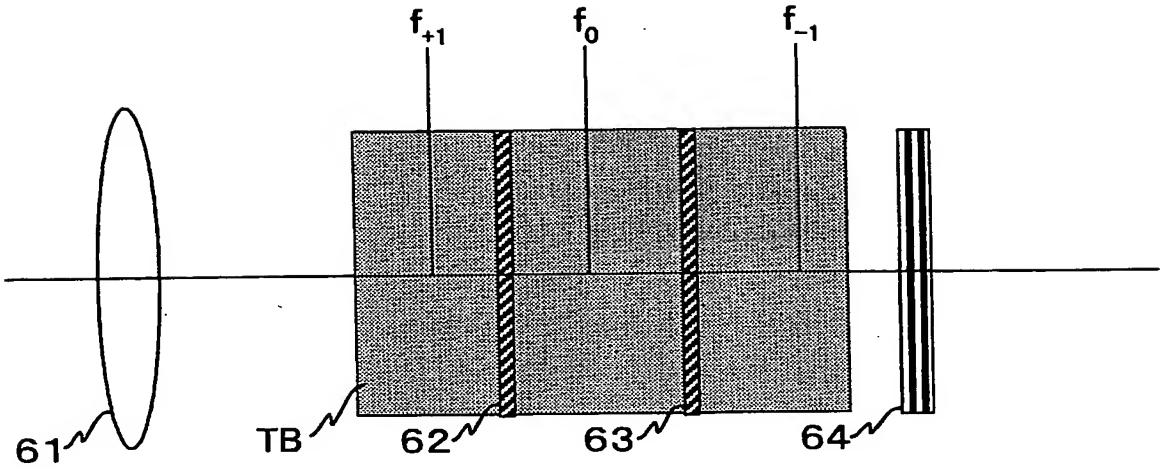

FIG.13B

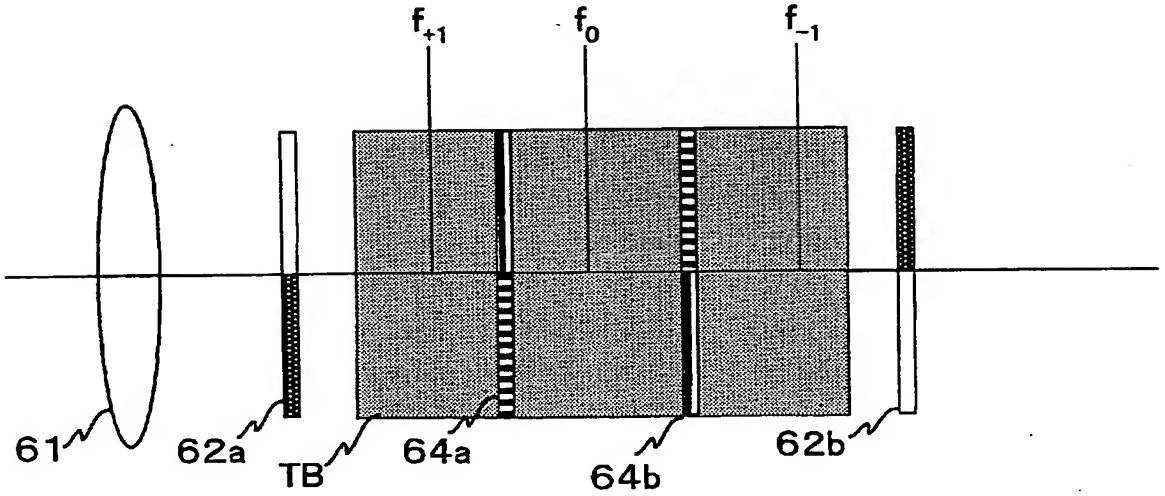

FIG.14

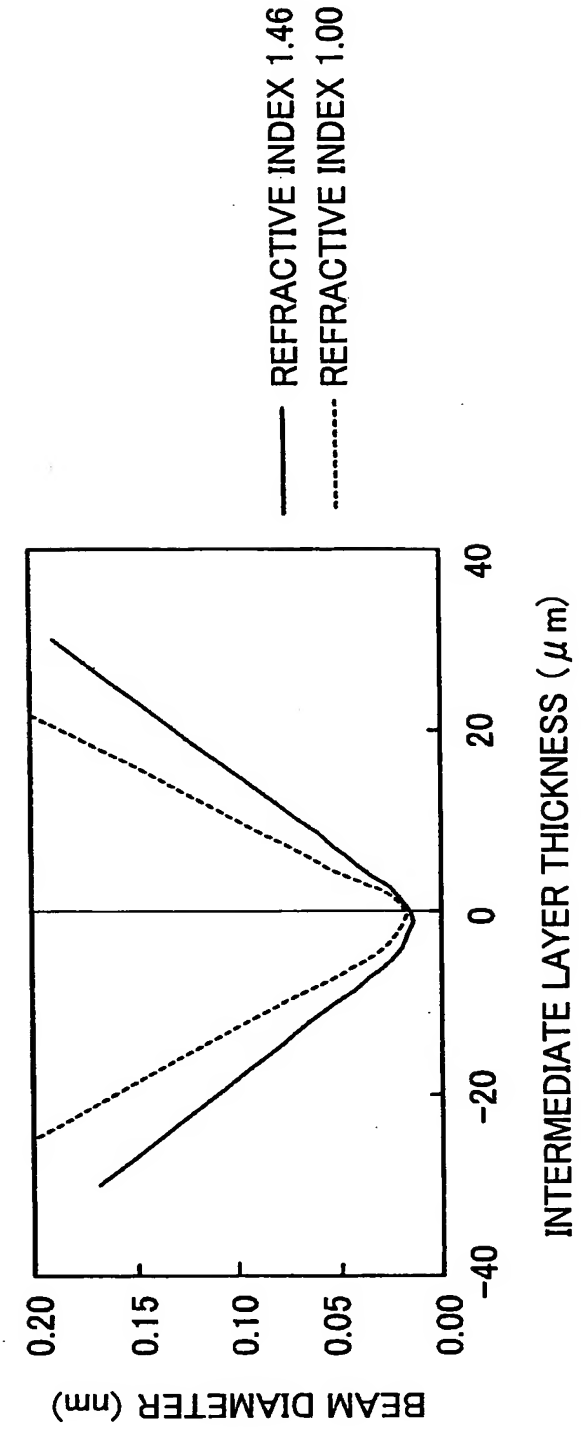
REFRACTIVE INDEX 1.46
REFRACTIVE INDEX 1.00
BEAM DIAMETER (nm)
0.20
0.15
0.10
0.05
0.00
-40
-20
0
20
40
INTERMEDIATE LAYER THICKNESS (μm)

FIG.15A

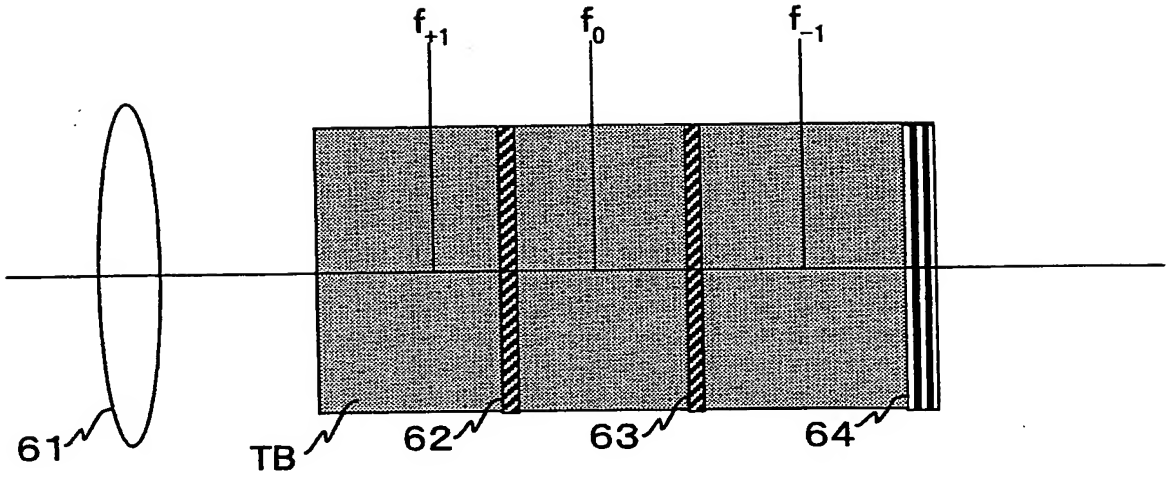

FIG.15B

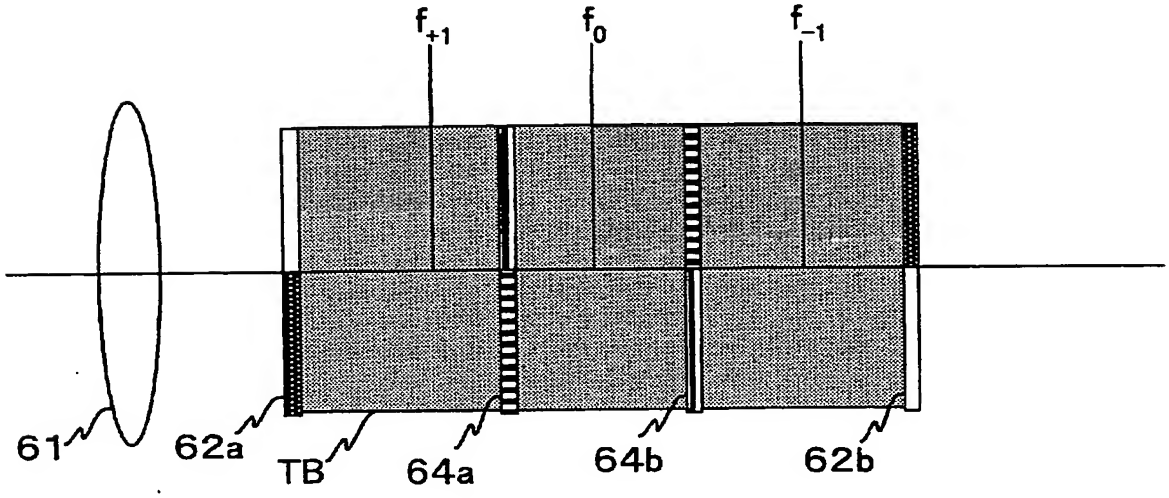

FIG.16A

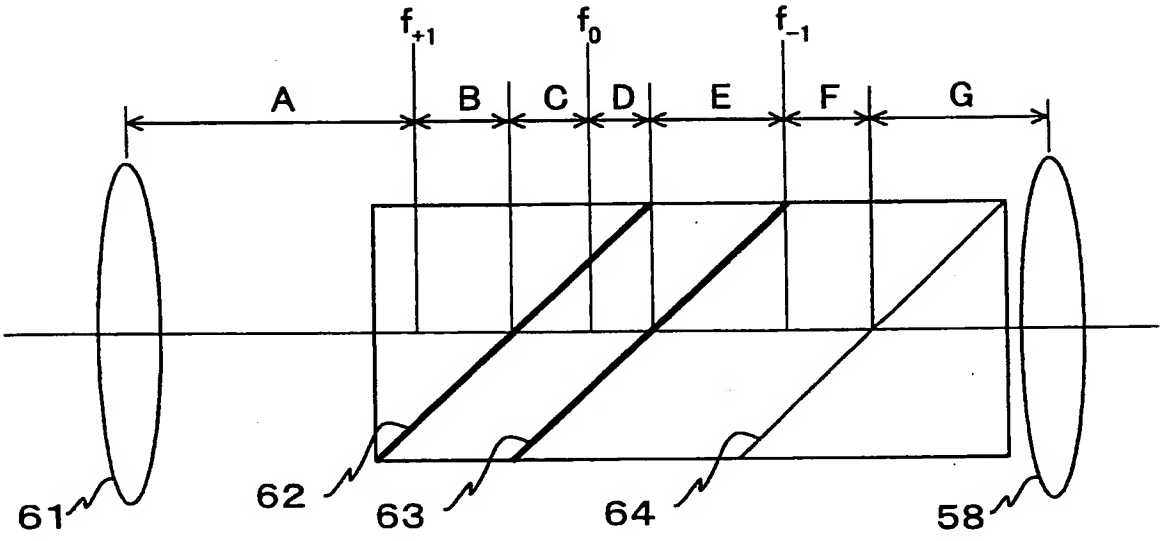

FIG.16B

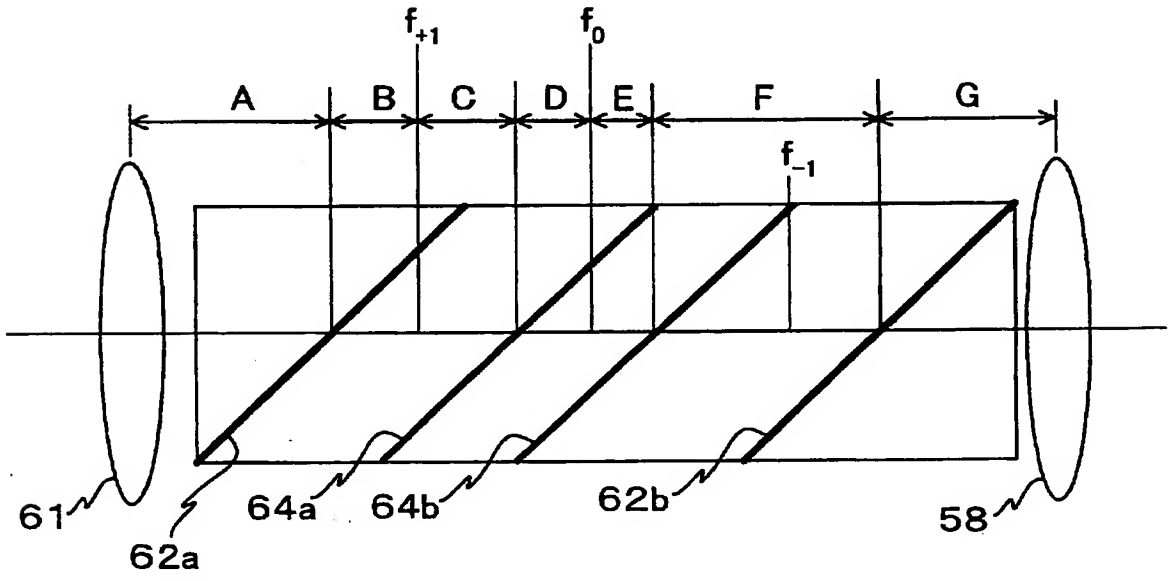

FIG.17A

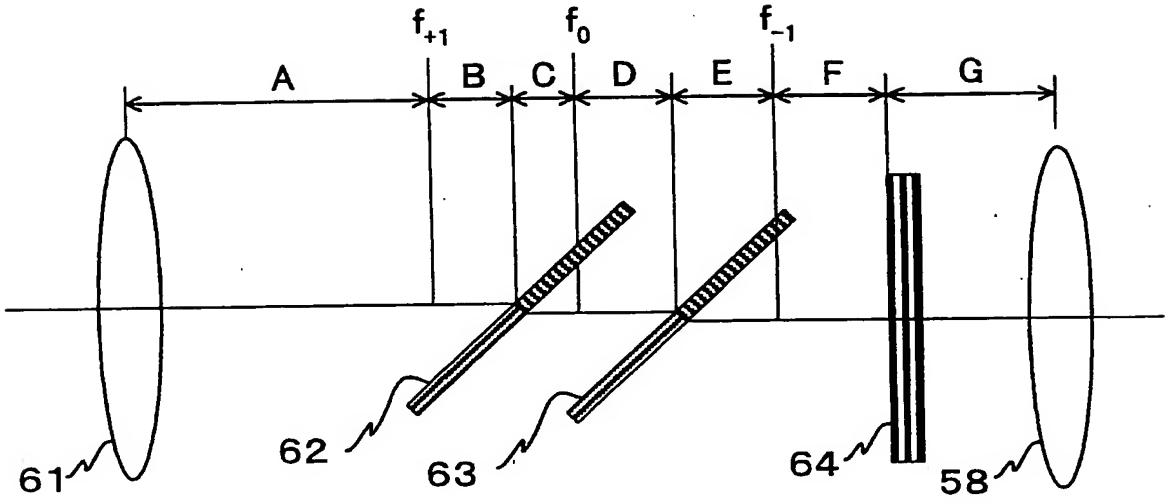

FIG.17B

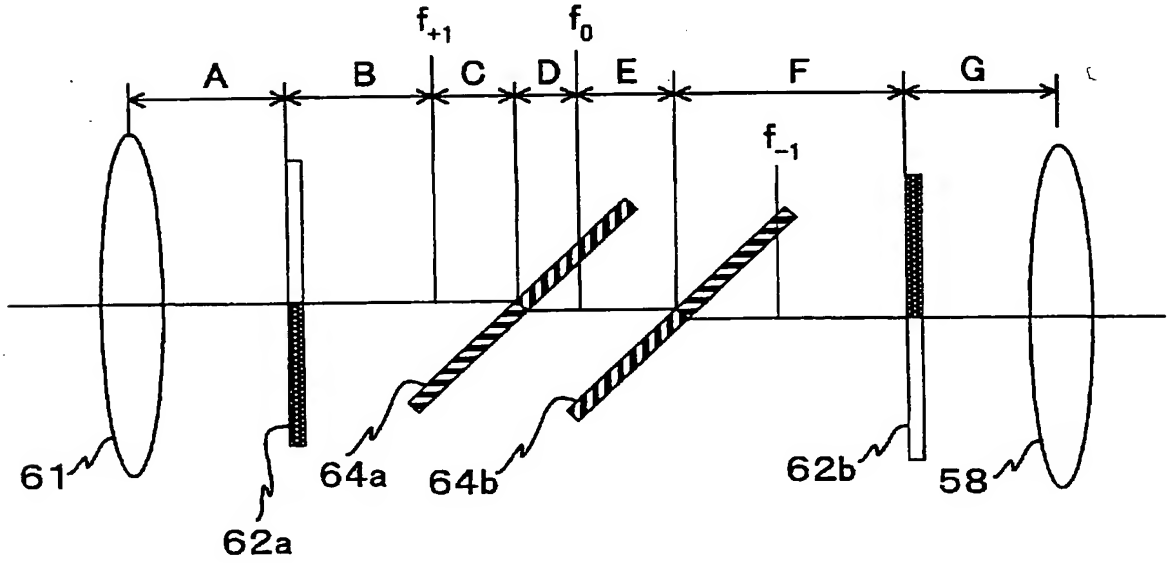

FIG.18A

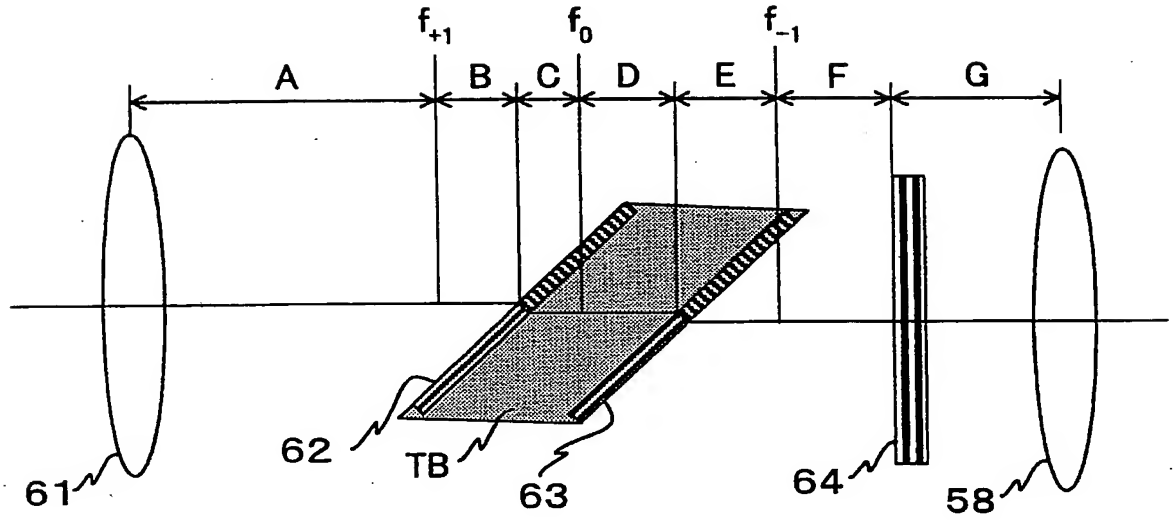

FIG.18B

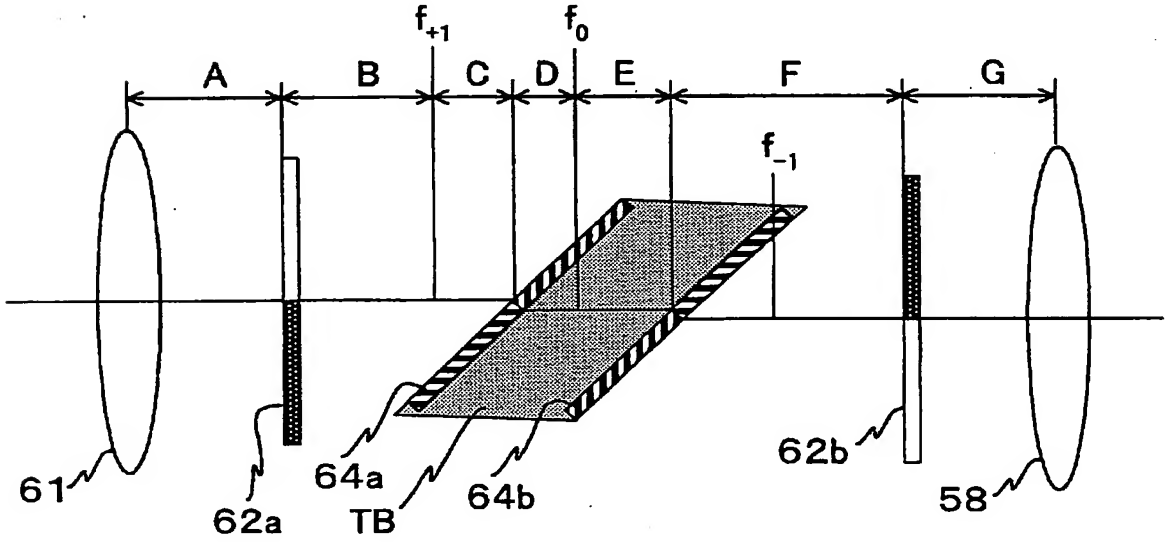

FIG.19

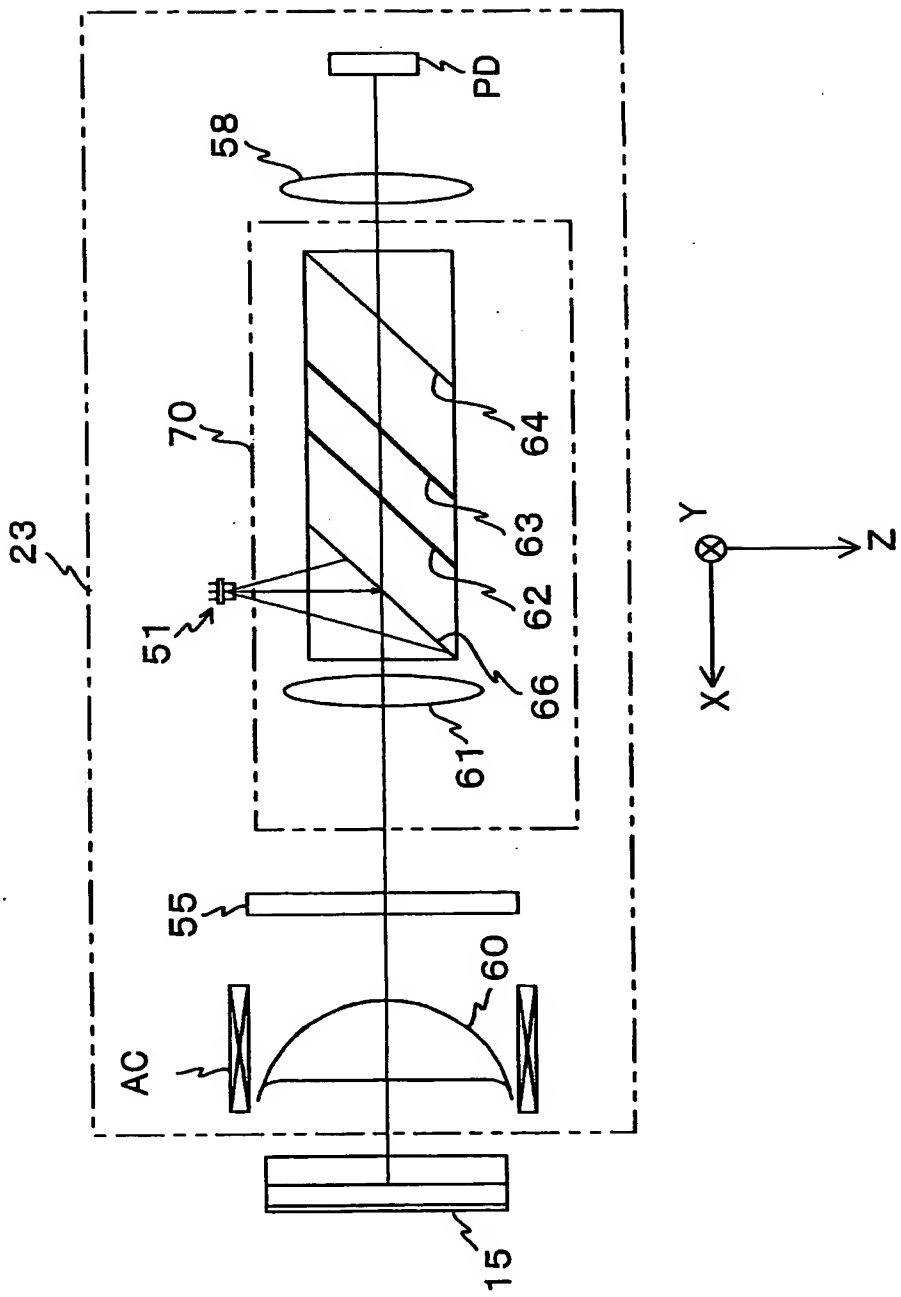

FIG.20

TARGET RECORDING LAYER	BEAM	OPTICAL PATH							
			A	B	C	D	E	F	G
FIRST RECORDING LAYER	FIRST REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	R	L	P	P	P
		AREA 2	S	S	L	R	P	P	P
	SECOND REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	R	R	S	S	—
		AREA 2	S	S	L	L	S	S	—
SECOND RECORDING LAYER	FIRST REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	R	R	S	S	—
		AREA 2	S	S	L	L	S	S	—
	SECOND REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	R	L	P	P	P
		AREA 2	S	S	L	R	P	P	P

FIG.21

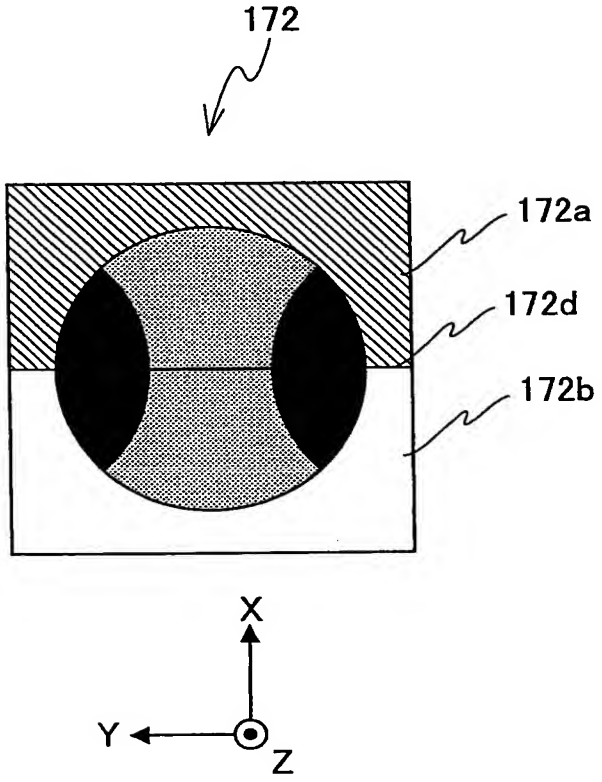

FIG.22

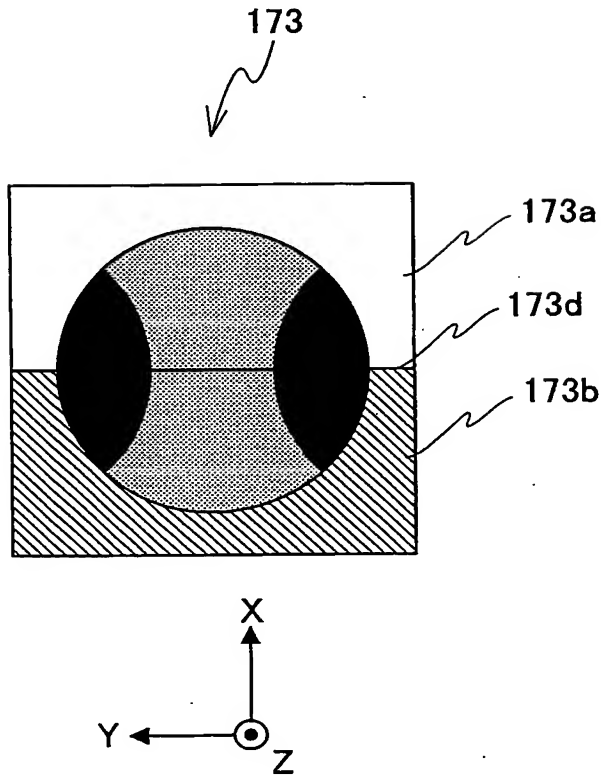

FIG.23

TARGET RECORDING LAYER	BEAM		OPTICAL PATH						
			A	B	C	D	E	F	G
FIRST RECORDING LAYER	FIRST REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	P	S	S	S	S
		AREA 2	S	S	S	P	S	S	S
	SECOND REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	P	P	P	P	—
		AREA 2	S	S	S	S	P	P	—
SECOND RECORDING LAYER	FIRST REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	P	P	P	P	—
		AREA 2	S	S	S	S	P	P	—
	SECOND REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	P	S	S	S	S
		AREA 2	S	S	S	P	S	S	S

FIG.24

TARGET RECORDING LAYER	BEAM		OPTICAL PATH						
			A	B	C	D	E	F	G
FIRST RECORDING LAYER	FIRST REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	P	S	P	P	P
		AREA 2	S	S	S	P	P	P	P
	SECOND REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	P	P	S	S	—
		AREA 2	S	S	S	S	S	S	—
SECOND RECORDING LAYER	FIRST REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	P	P	S	S	—
		AREA 2	S	S	S	S	S	S	—
	SECOND REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	P	S	P	P	P
		AREA 2	S	S	S	P	P	P	P

FIG.25

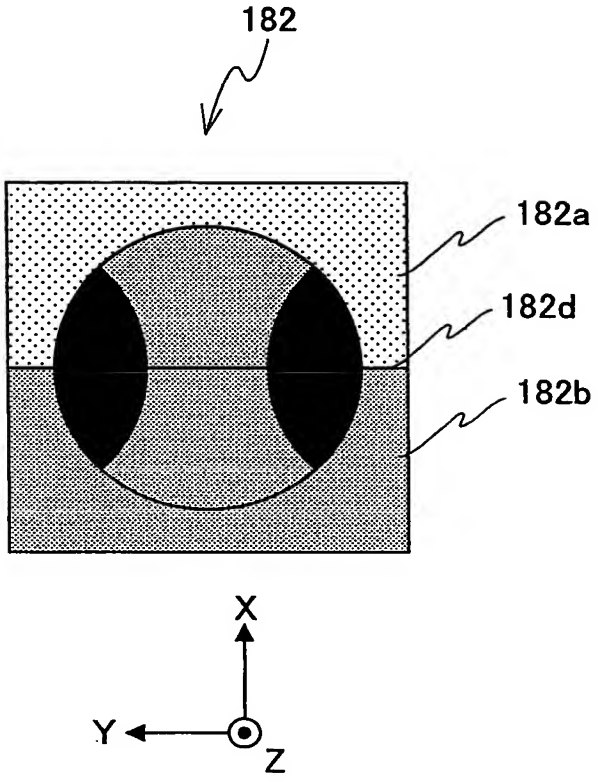

FIG.26

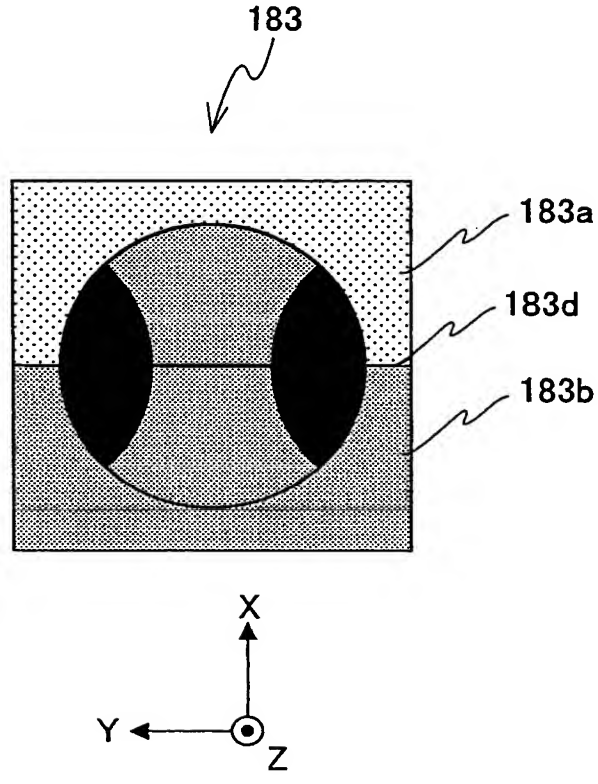

FIG.27

TARGET RECORDING LAYER	BEAM		OPTICAL PATH						
			A	B	C	D	E	F	G
FIRST RECORDING LAYER	FIRST REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	0	0	+45	−45	0	0	0
		AREA 2	0	0	−45	+45	0	0	0
	SECOND REFLECTED LIGHT (STRAY LIGHT)	AREA 1	0	0	+45	+45	+90	+90	—
		AREA 2	0	0	−45	−45	−90	−90	—
SECOND RECORDING LAYER	FIRST REFLECTED LIGHT (STRAY LIGHT)	AREA 1	0	0	+45	+45	+90	−90	—
		AREA 2	0	0	−45	−45	−90	+90	—
	SECOND REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	0	0	+45	−45	0	0	0
		AREA 2	0	0	−45	+45	0	0	0

FIG.28

TARGET RECORDING LAYER	BEAM	OPTICAL PATH							
			A	B	C	D	E	F	G
FIRST RECORDING LAYER	FIRST REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	0	0	+45	−45	−90	−90	−90
		AREA 2	0	0	−45	+45	+90	+90	—
	SECOND REFLECTED LIGHT (STRAY LIGHT)	AREA 1	0	0	+45	+45	0	0	—
		AREA 2	0	0	−45	−45	0	0	—
SECOND RECORDING LAYER	FIRST REFLECTED LIGHT (STRAY LIGHT)	AREA 1	0	0	+45	+45	0	0	—
		AREA 2	0	0	−45	−45	0	0	—
	SECOND REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	0	0	+45	−45	−90	−90	−90
		AREA 2	0	0	−45	+45	+90	+90	—

FIG.29

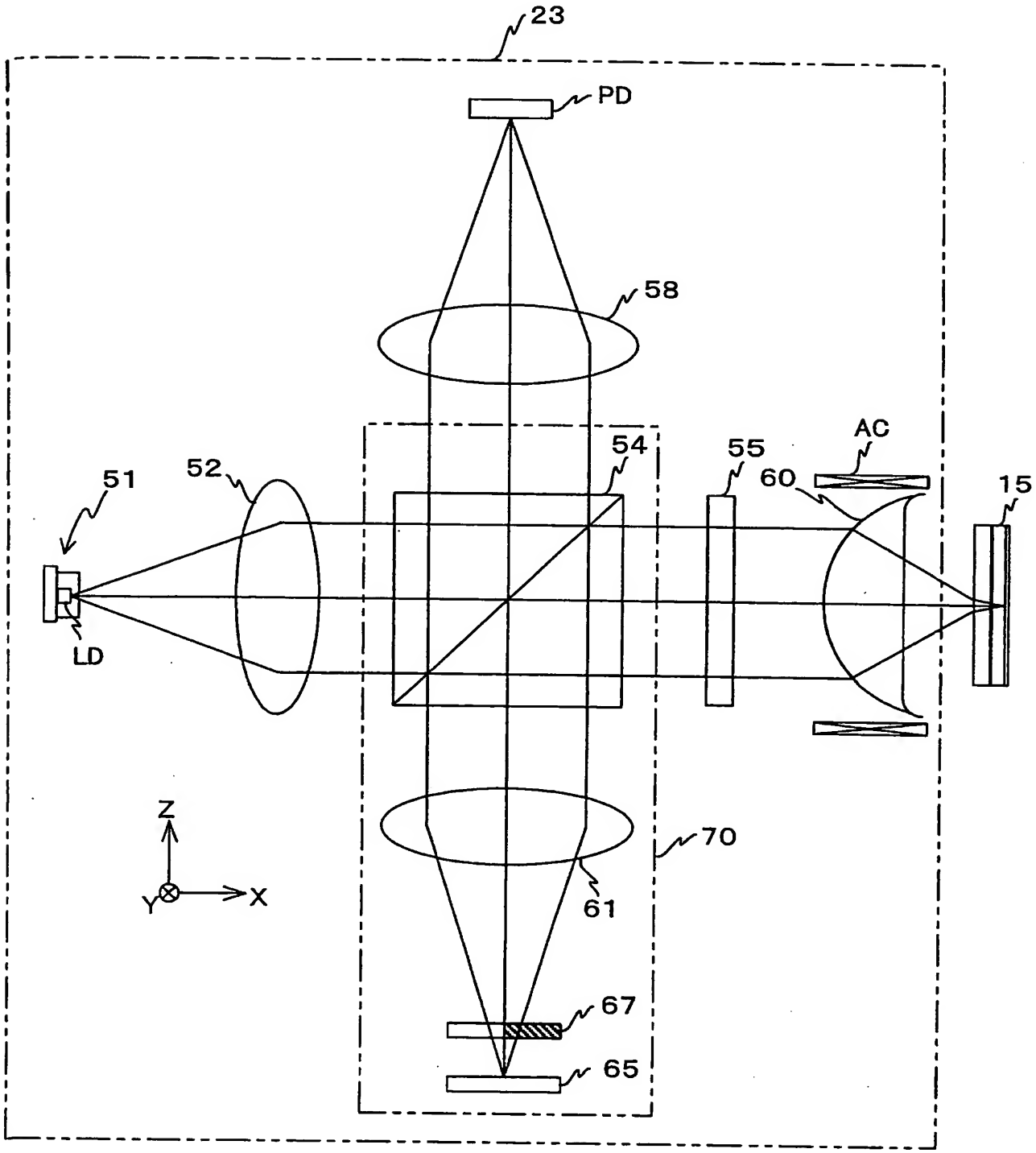

FIG.30

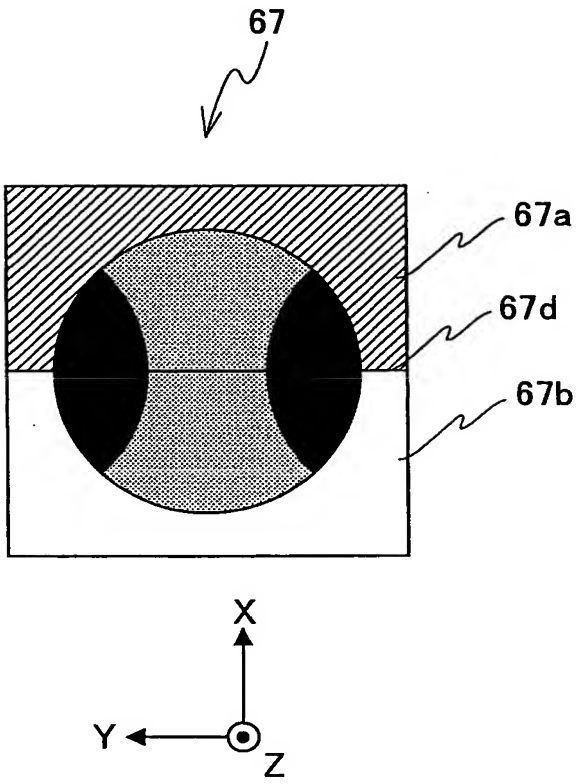

FIG.31

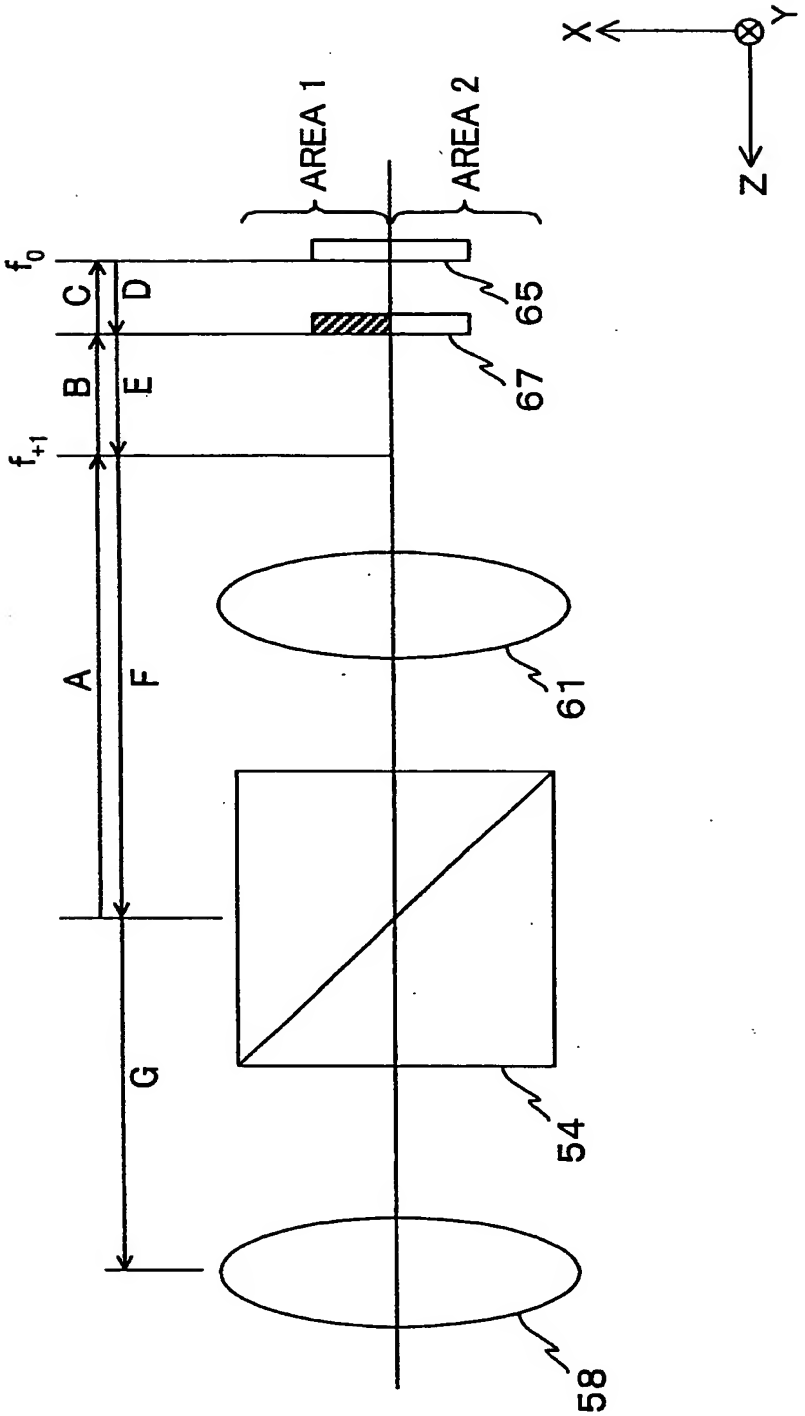

FIG.32

TARGET RECORDING LAYER	BEAM		OPTICAL PATH						
			A	B	C	D	E	F	G
FIRST RECORDING LAYER	FIRST REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	P	S	P	P	P
		AREA 2	S	S	S	P	P	P	P
	SECOND REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	P	P	S	S	—
		AREA 2	S	S	S	S	S	S	—
SECOND RECORDING LAYER	FIRST REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	P	P	S	S	—
		AREA 2	S	S	S	S	S	S	—
	SECOND REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	P	S	P	P	P
		AREA 2	S	S	S	P	P	P	P

FIG.33

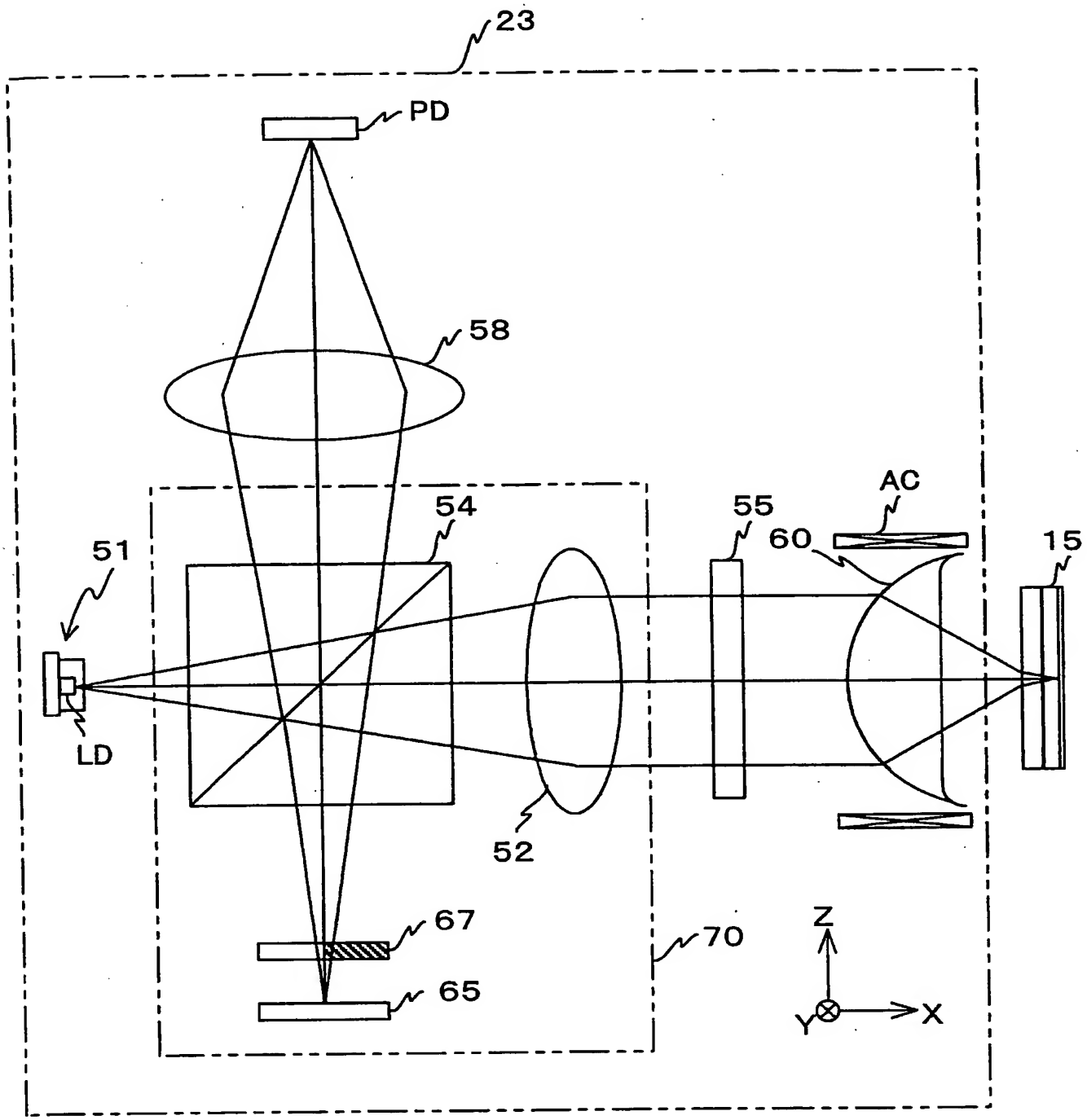

FIG.34

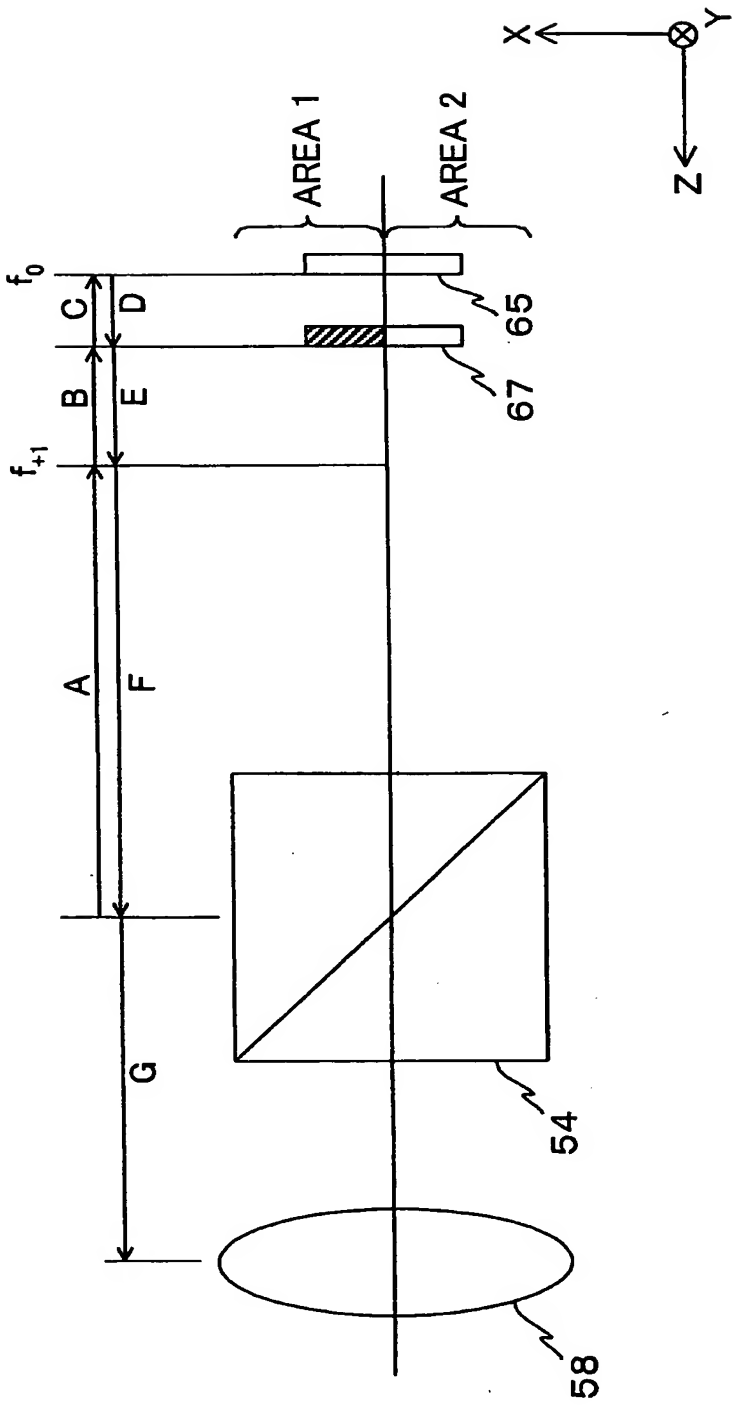

FIG.35

TARGET RECORDING LAYER	BEAM	OPTICAL PATH							
			A	B	C	D	E	F	G
FIRST RECORDING LAYER	FIRST REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	P	S	P	P	P
		AREA 2	S	S	S	P	P	P	P
	SECOND REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	P	P	S	S	—
		AREA 2	S	S	S	S	S	S	—
SECOND RECORDING LAYER	FIRST REFLECTED LIGHT (STRAY LIGHT)	AREA 1	S	S	P	P	S	S	—
		AREA 2	S	S	S	S	S	S	—
	SECOND REFLECTED LIGHT (SIGNAL LIGHT)	AREA 1	S	S	P	S	P	P	P
		AREA 2	S	S	S	P	P	P	P

FIG.36

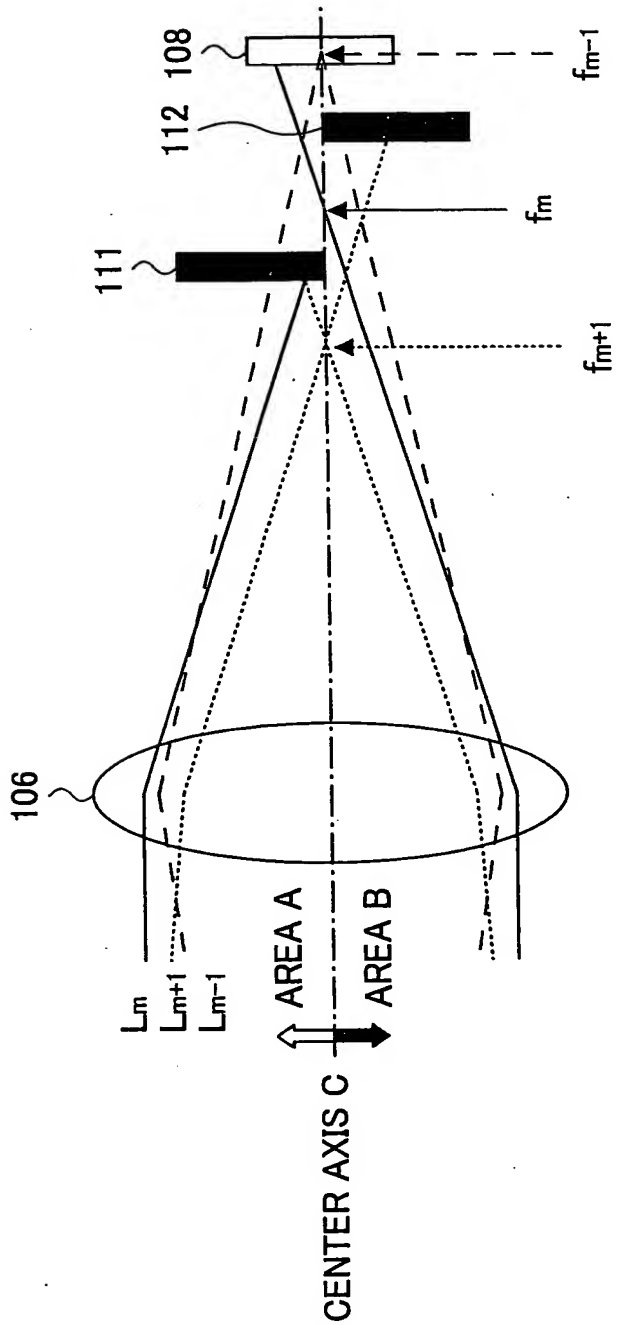
200
106
108
112
111
f_{m-1}
f_m
f_{m+1}
L_m
L_{m+1}
L_{m-1}
AREA A
AREA B
CENTER AXIS C

FIG.37

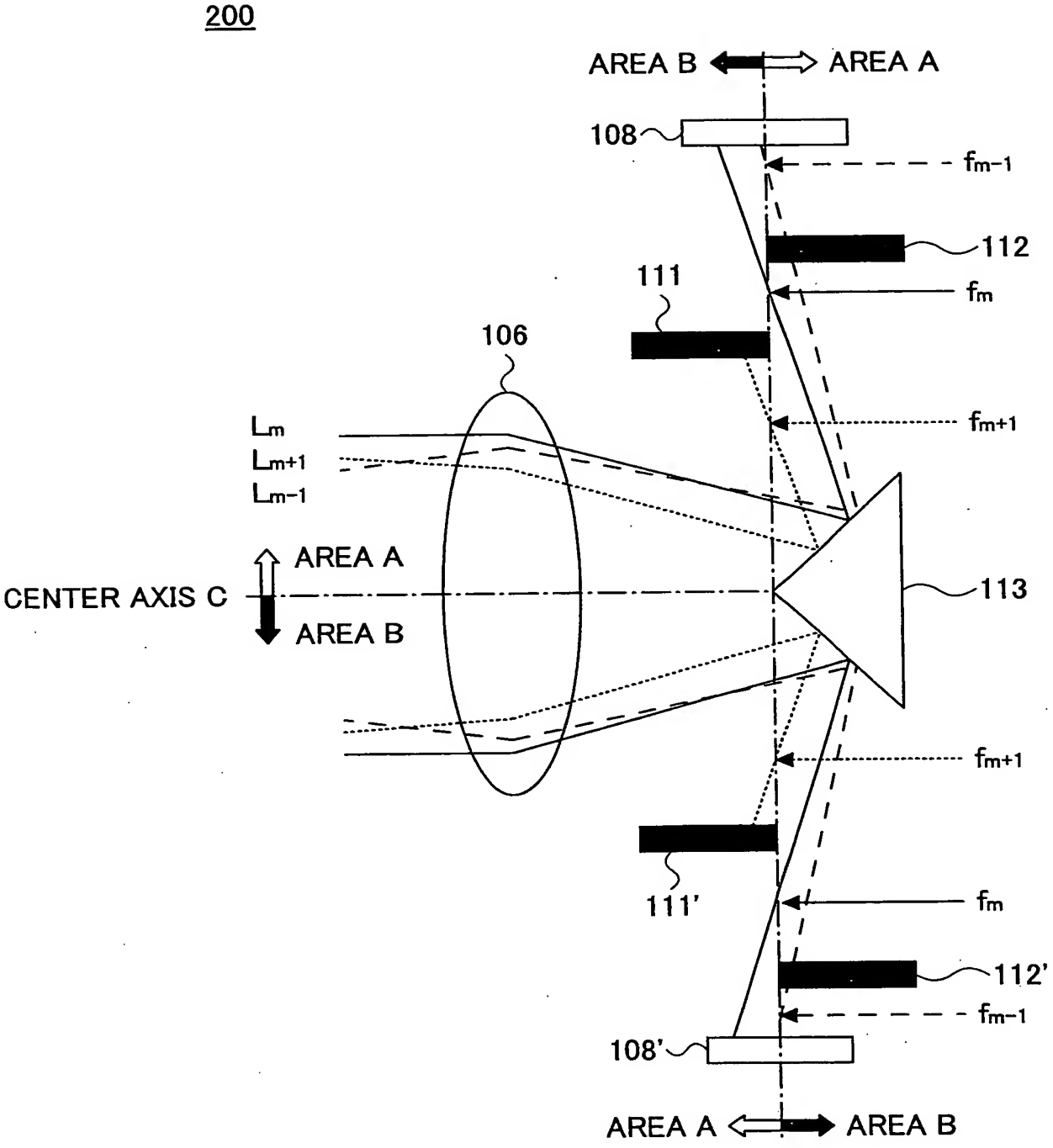
200
AREA B
AREA A
108
fm-1
112
111
fm
106
fm+1
Lm
Lm+1
Lm-1
AREA A
CENTER AXIS C
AREA B
113
fm+1
111'
fm
112'
fm-1
108'
AREA A
AREA B

FIG.38

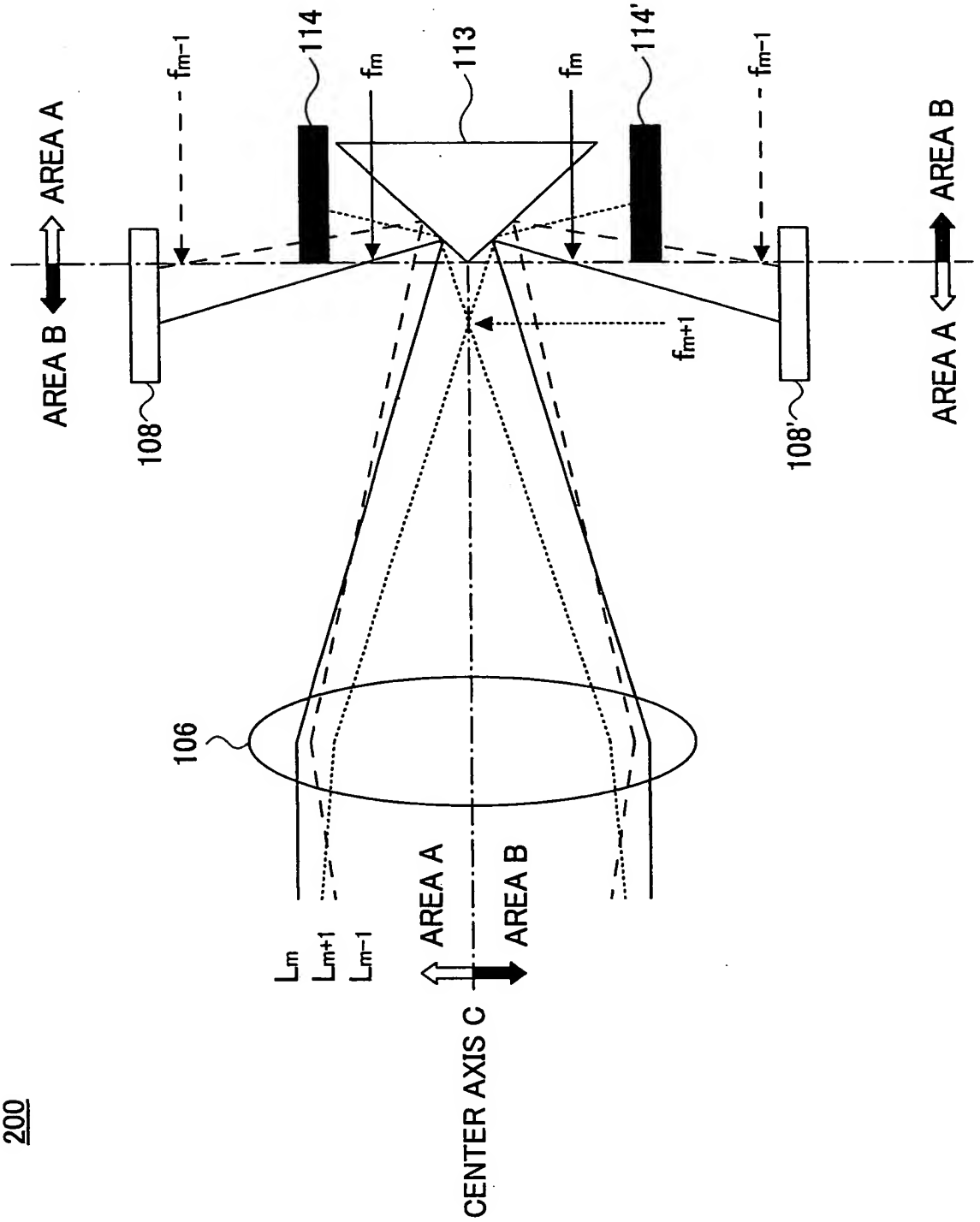
200
AREA A
AREA B
f_{m-1}
114
f_m
113
f_m
114'
f_{m-1}
AREA B
AREA A
108
f_{m+1}
108'
106
L_m
L_{m+1}
L_{m-1}
AREA A
AREA B
CENTER AXIS C

FIG.39

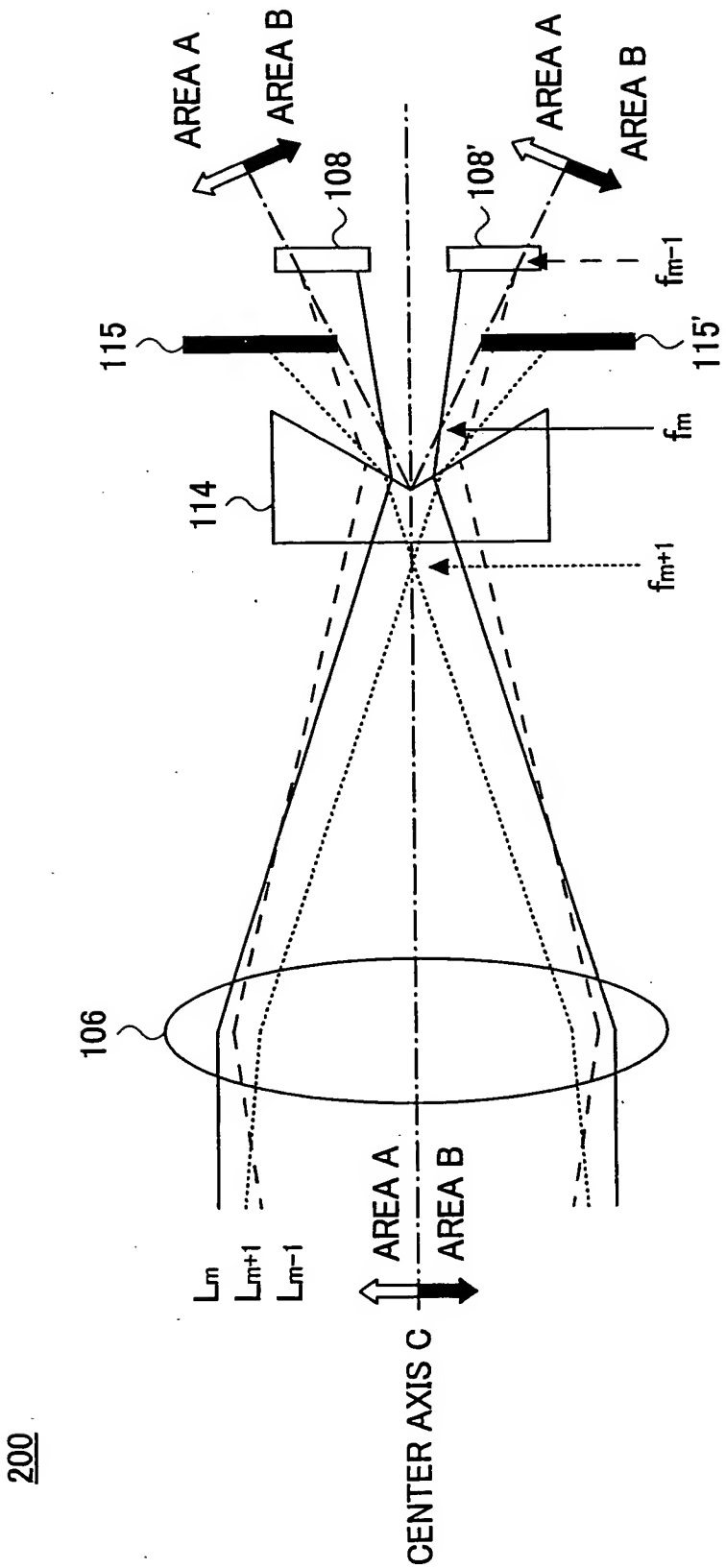
200
106
114
115
115'
108
108'
AREA A
AREA B
AREA A
AREA B
AREA A
AREA B
f_{m-1}
f_m
f_{m+1}
L_m
L_{m+1}
L_{m-1}
CENTER AXIS C

FIG.40

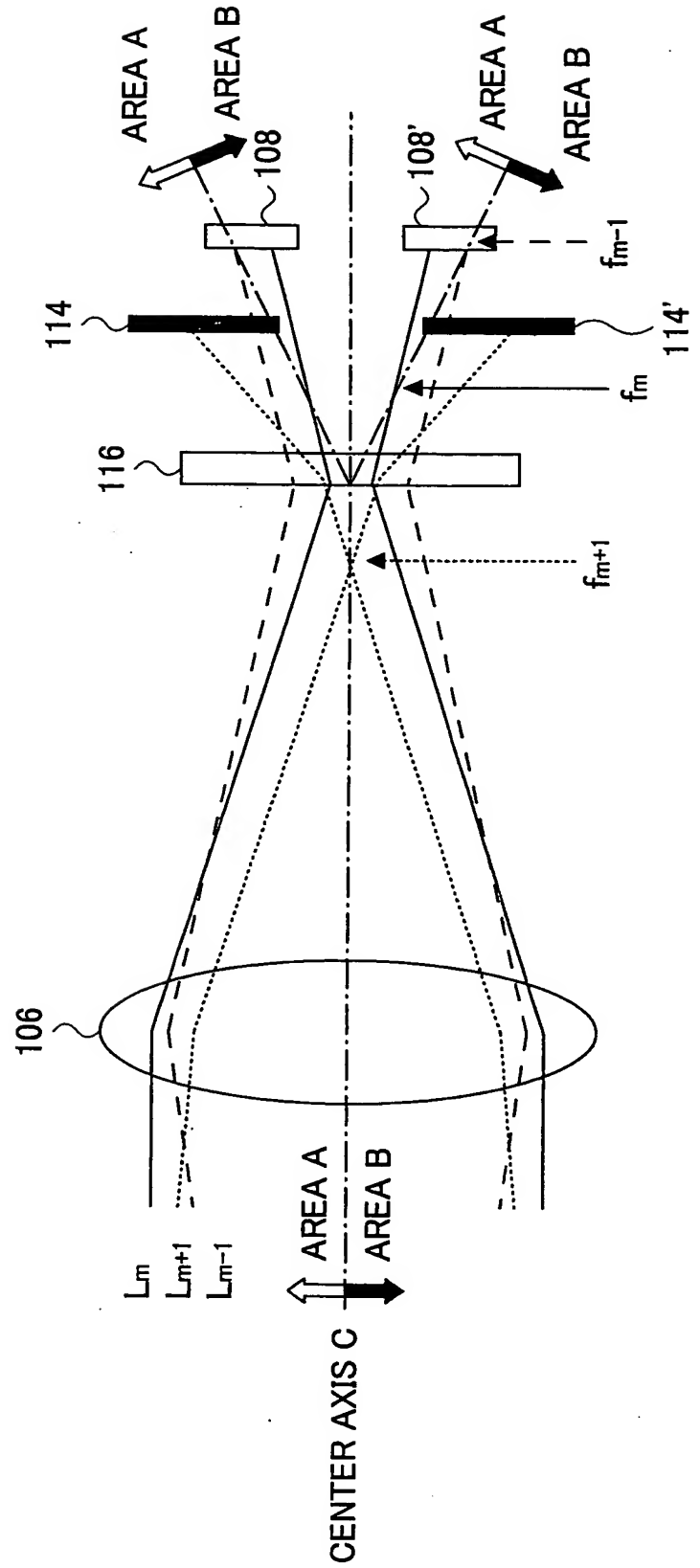
200
AREA A
AREA B
108
108'
AREA A
AREA B
114
114'
116
106
f_{m-1}
f_m
f_{m+1}
L_m
L_{m+1}
L_{m-1}
AREA A
AREA B
CENTER AXIS C

FIG.41

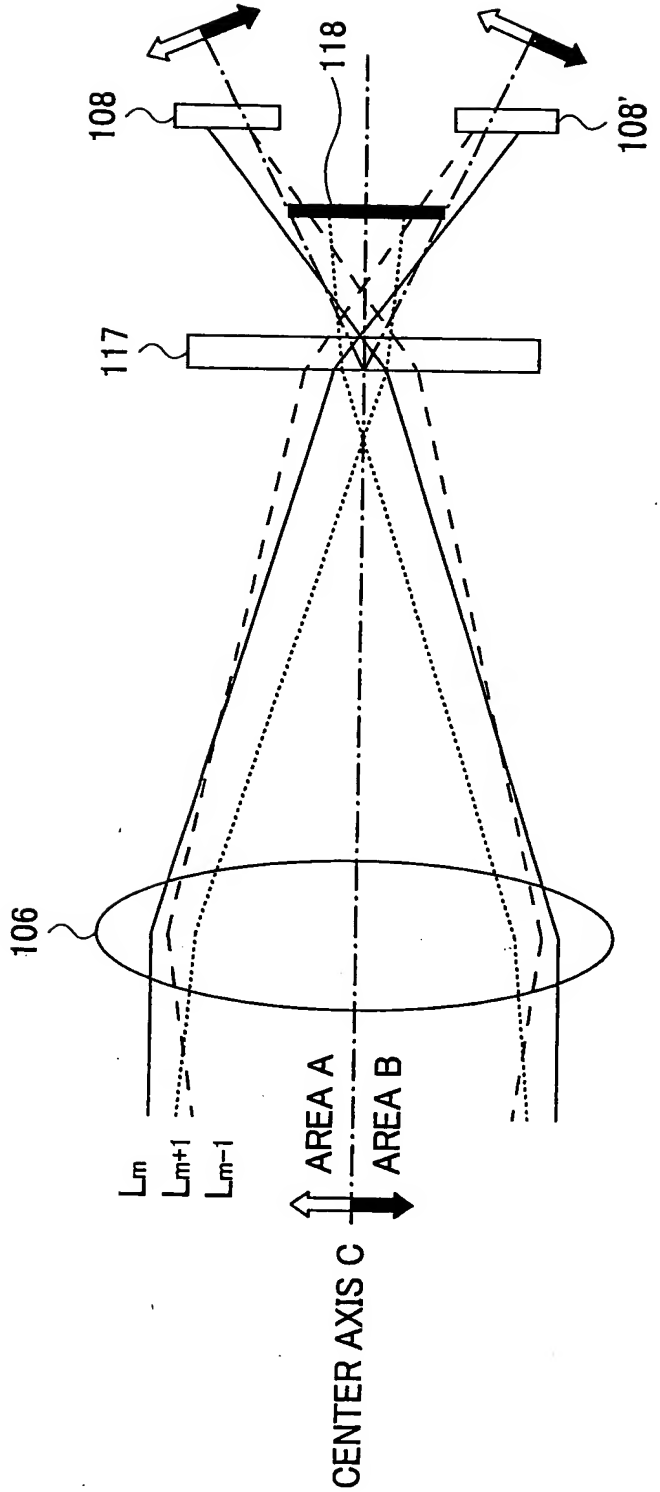

FIG.42A

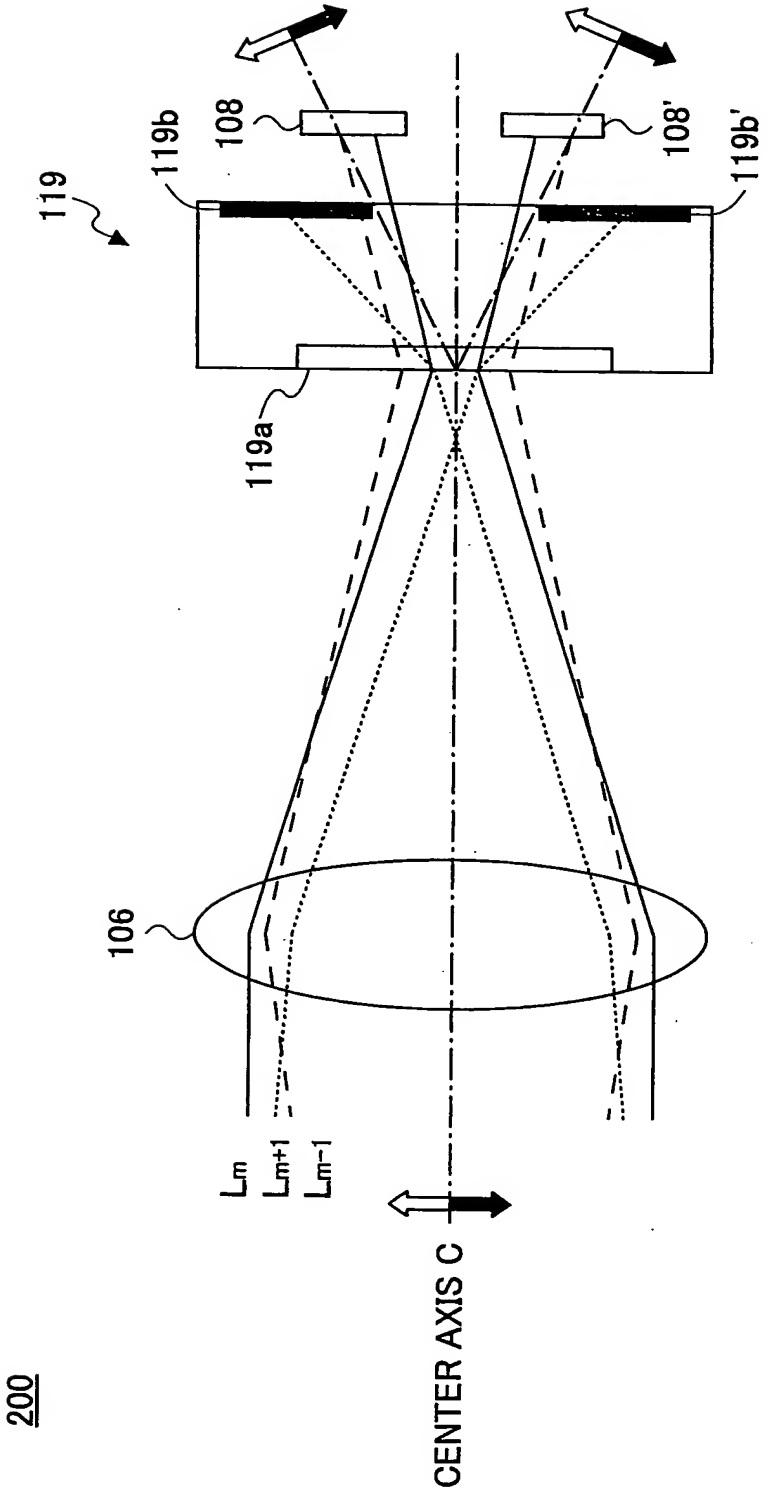

FIG.42B

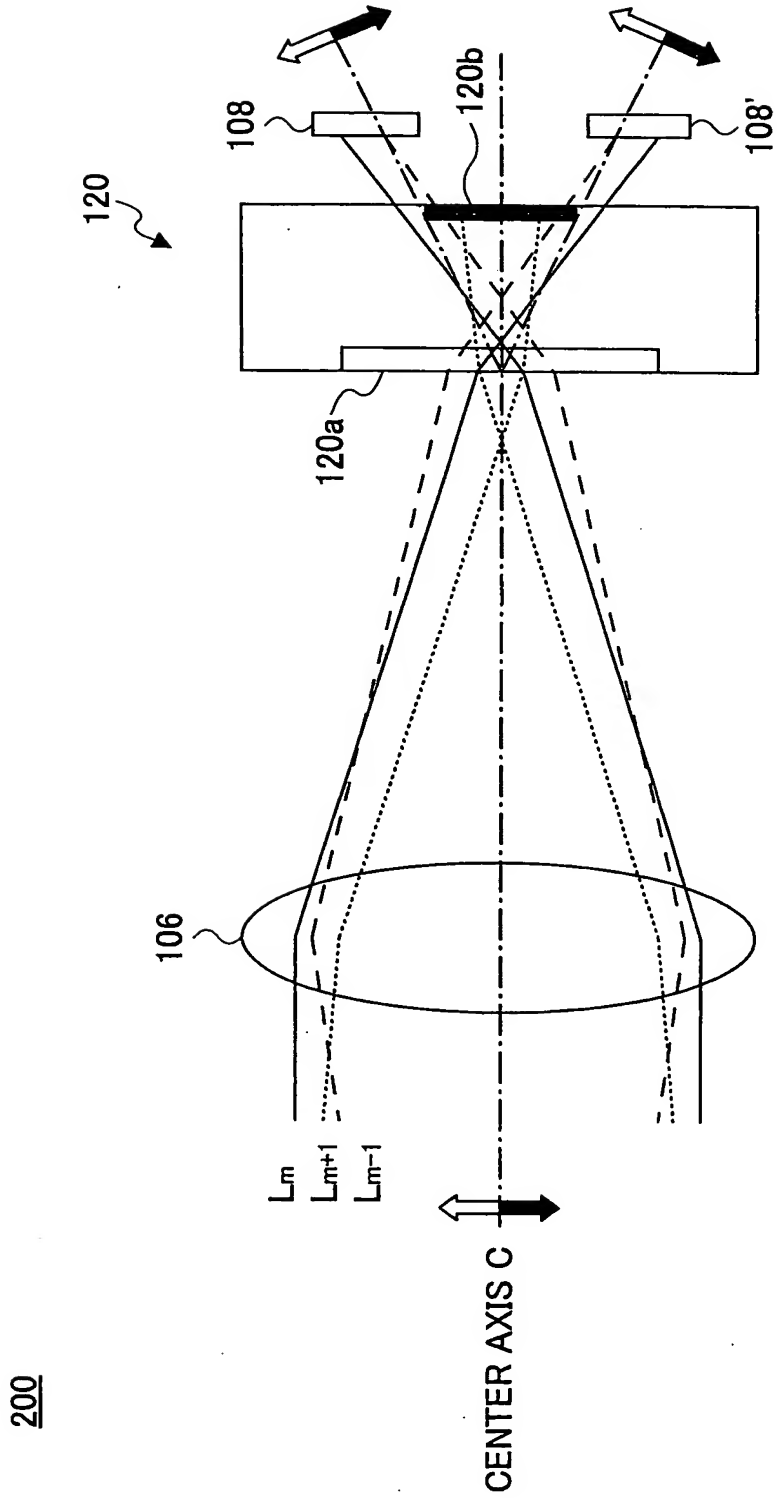

FIG.43

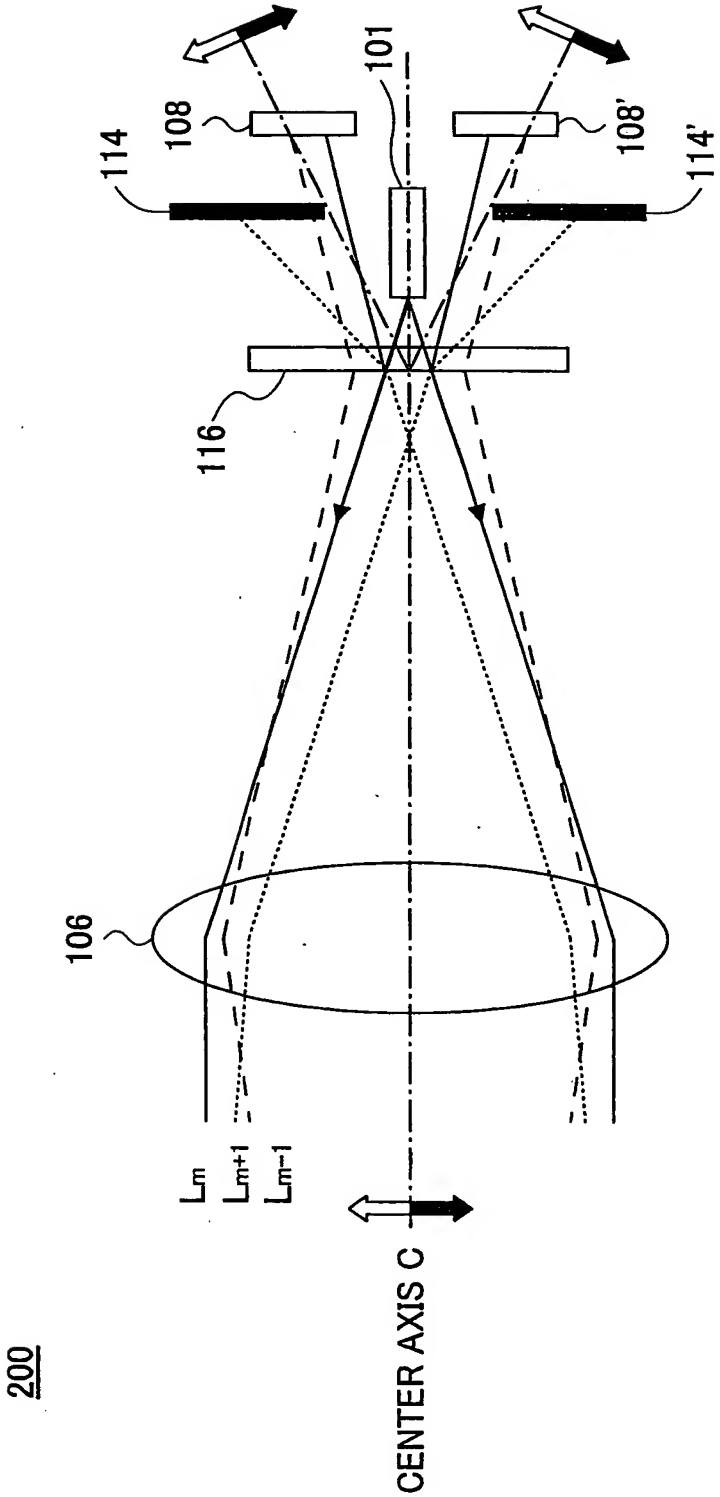

FIG.44

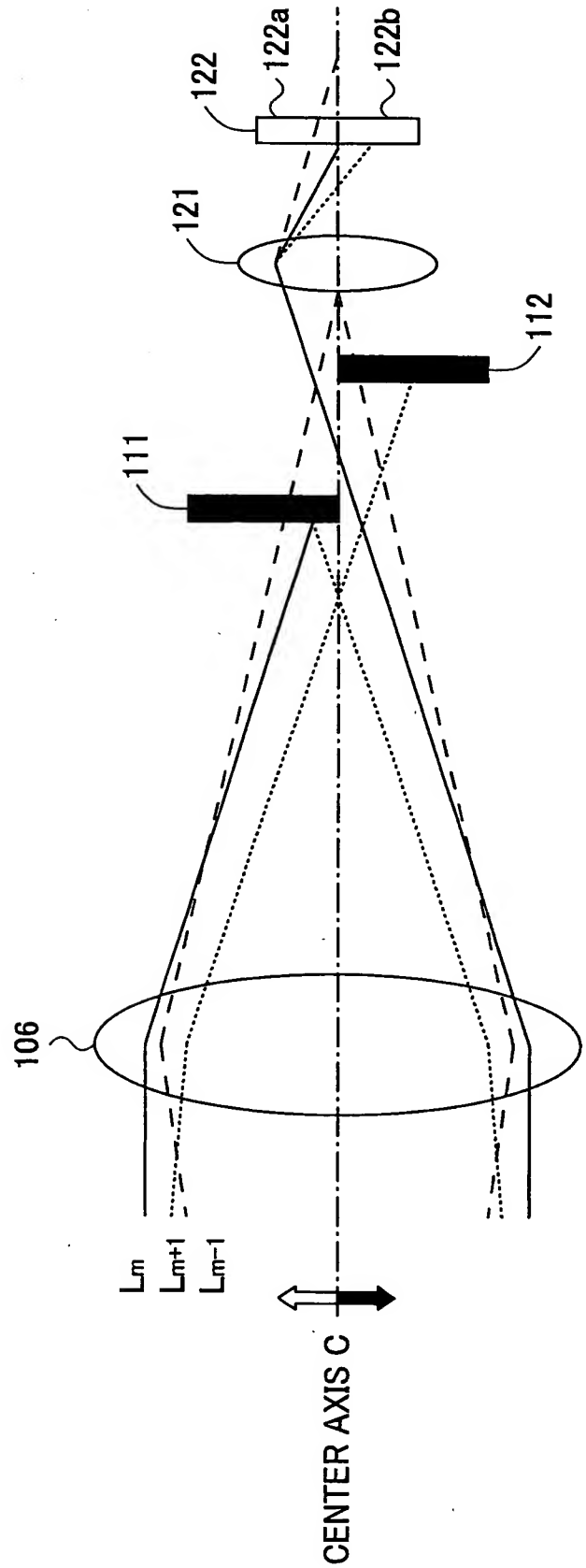

FIG.45A

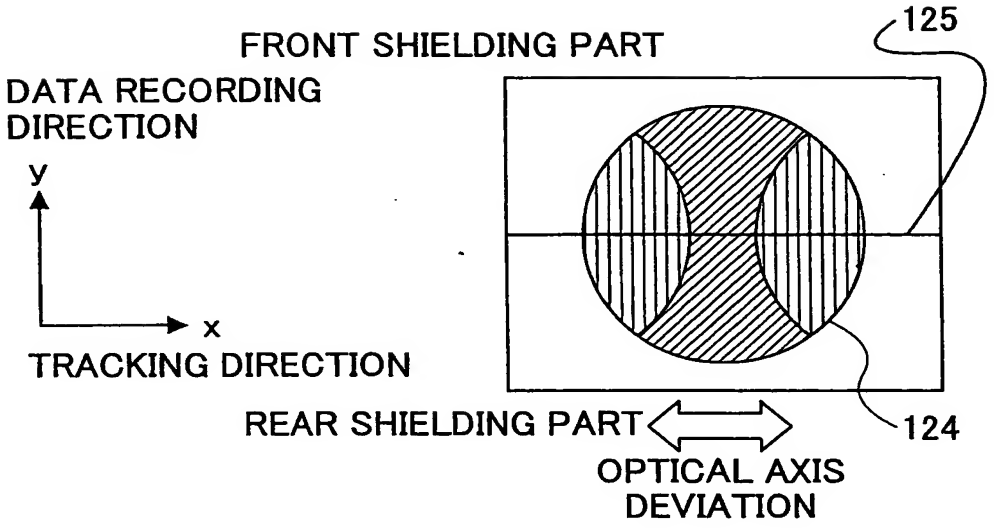

FIG.45B

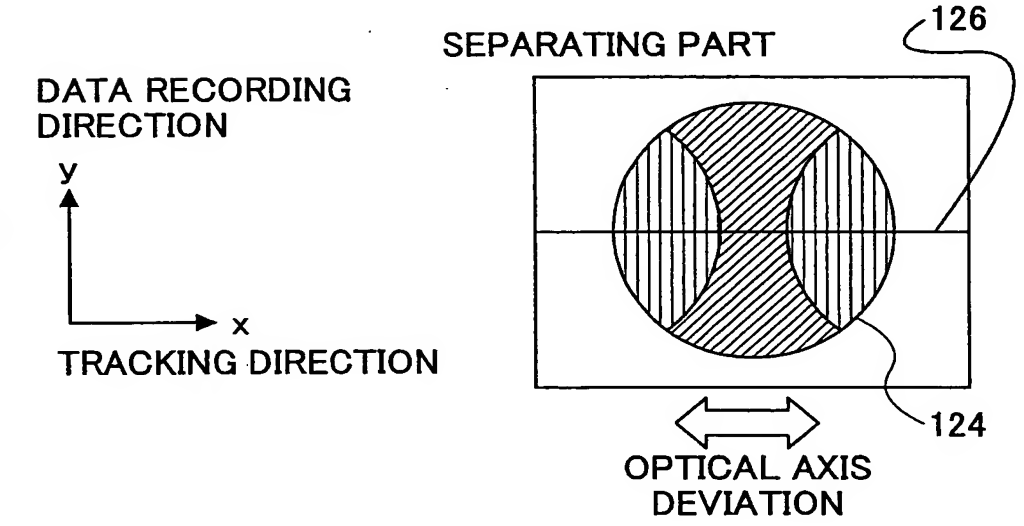

FIG.45C

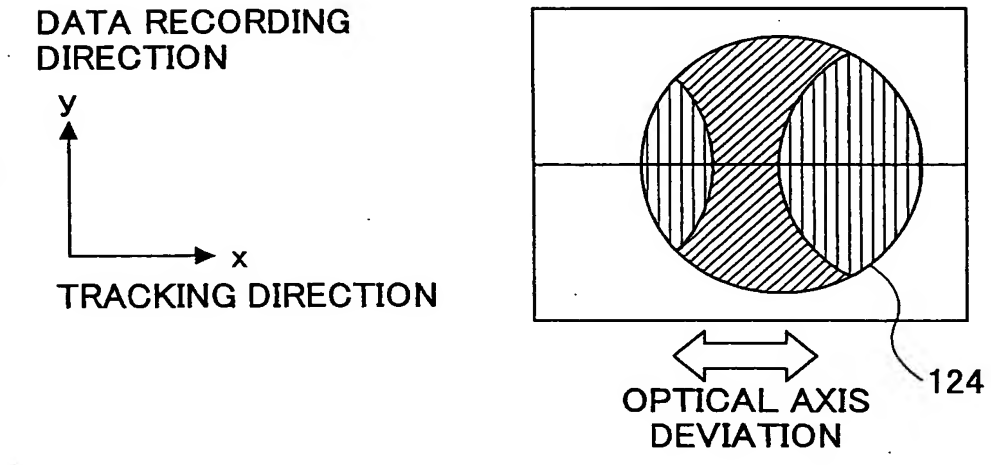

FIG.46A

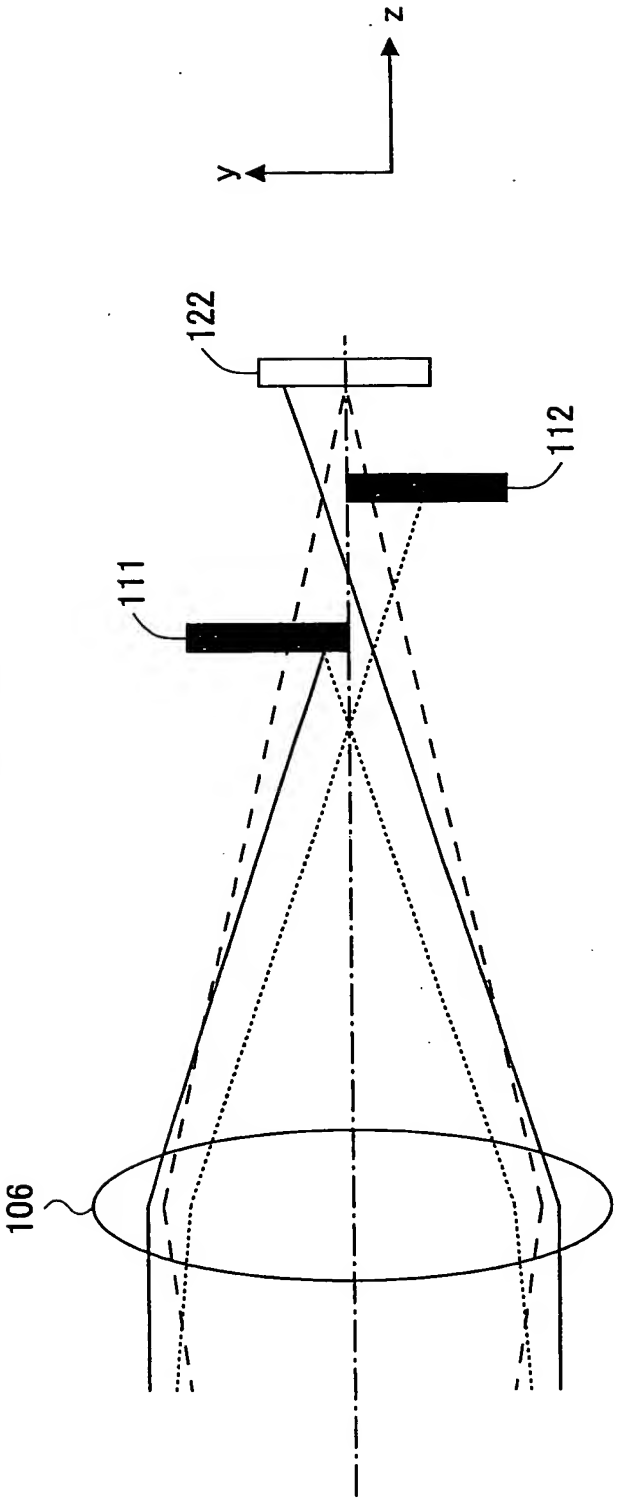

FIG.46B

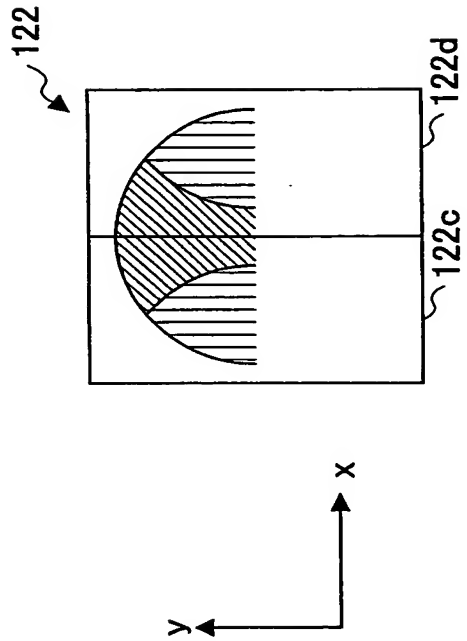

FIG.47A

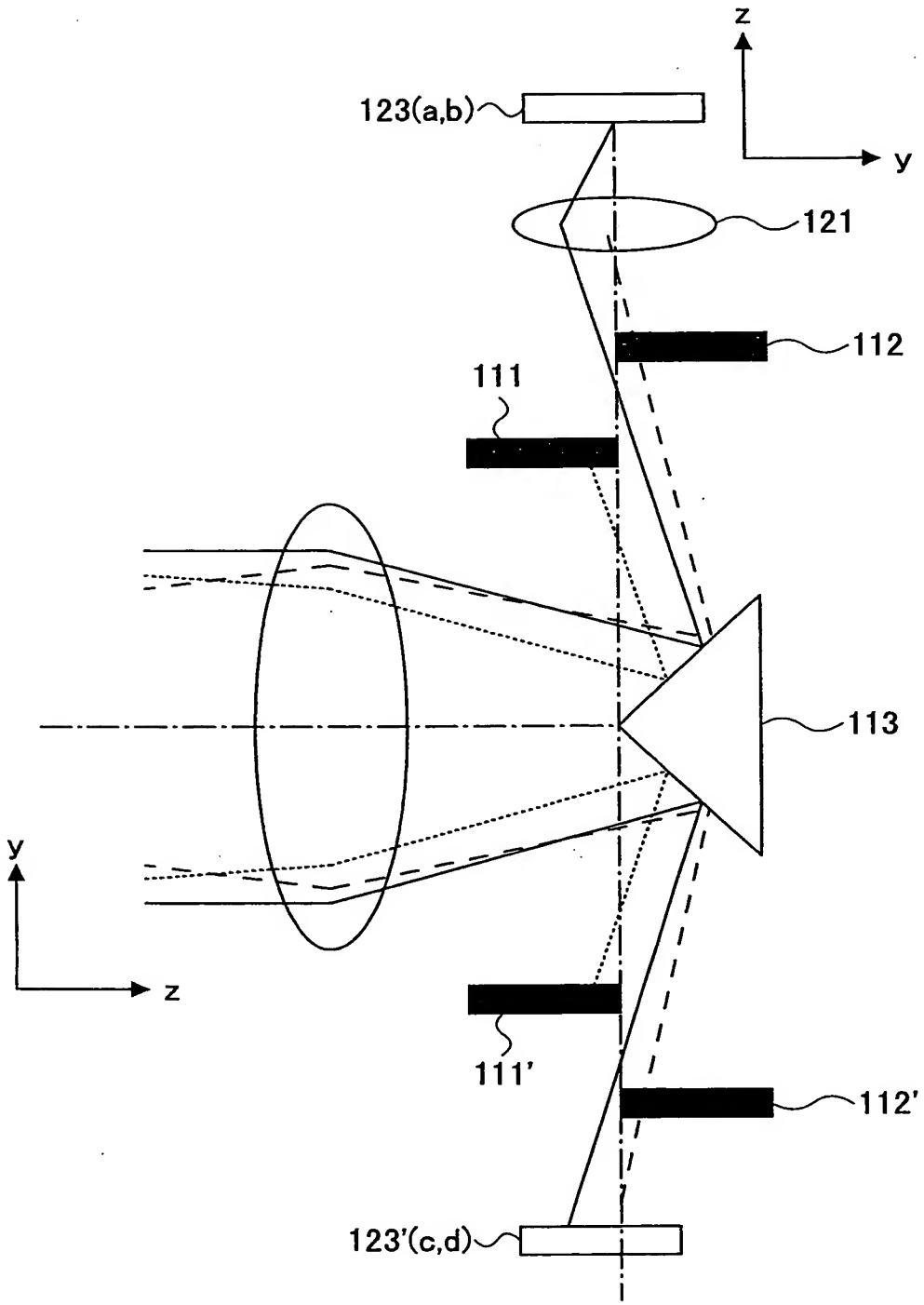

FIG.47B

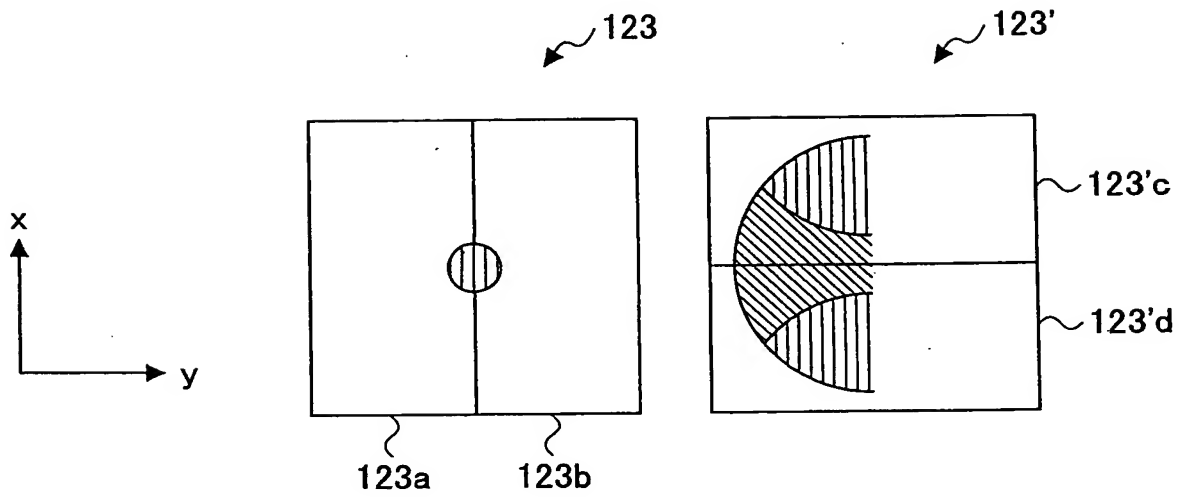

FIG.48

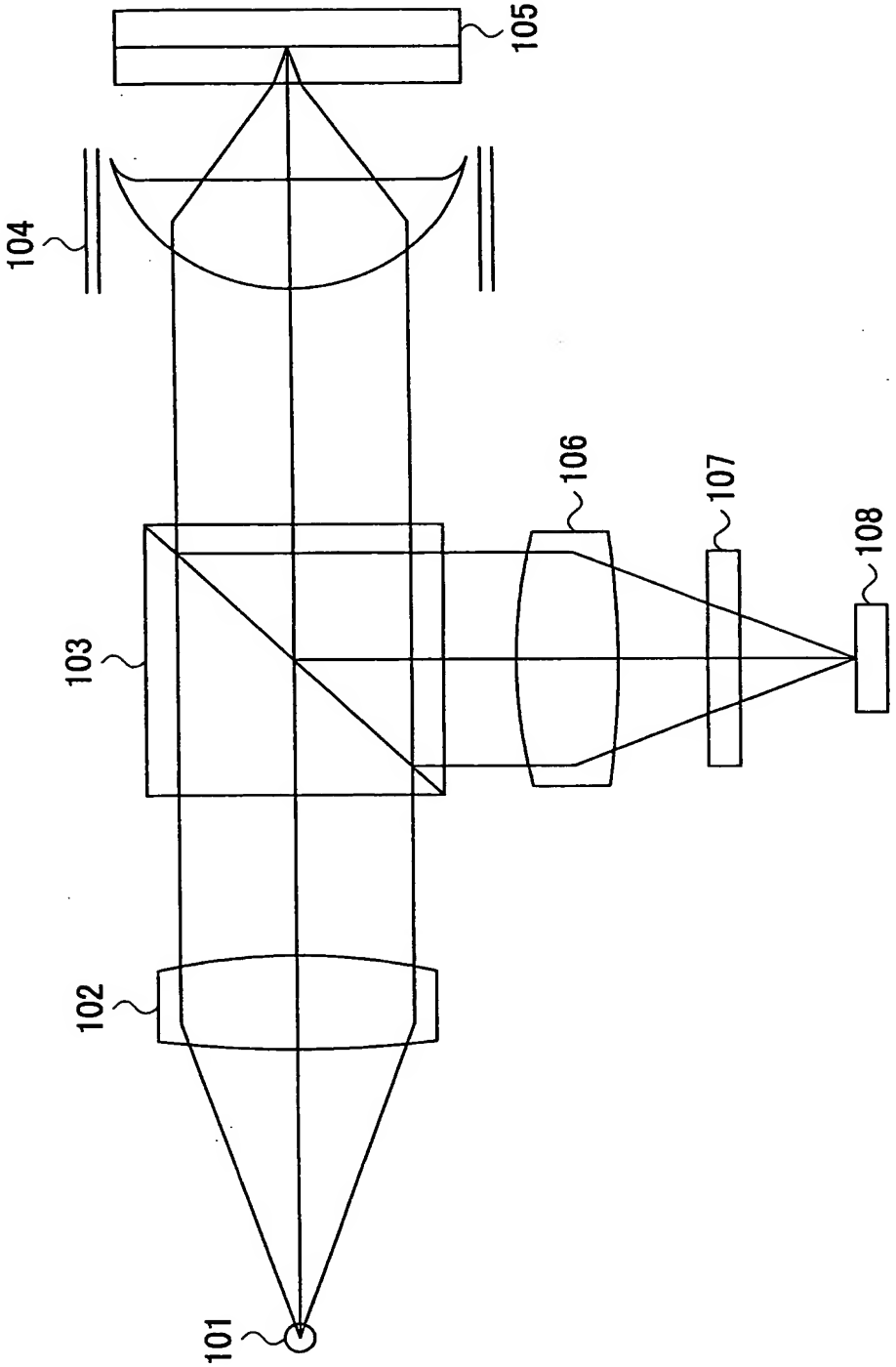

FIG.49

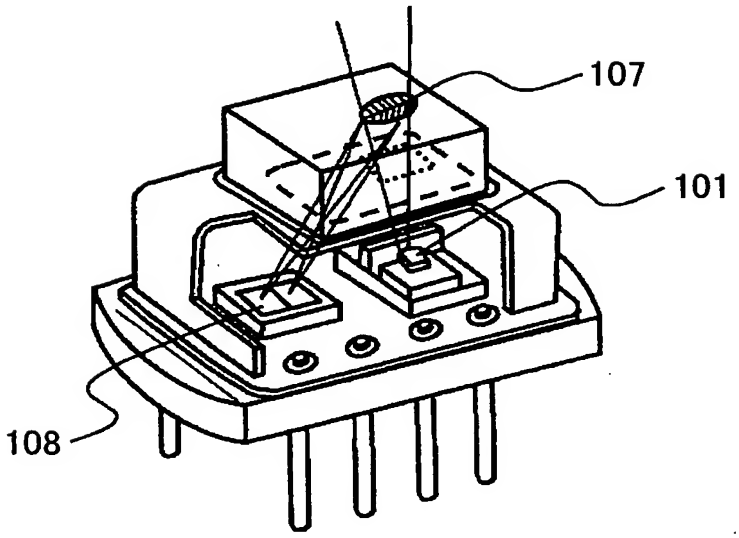

FIG.50

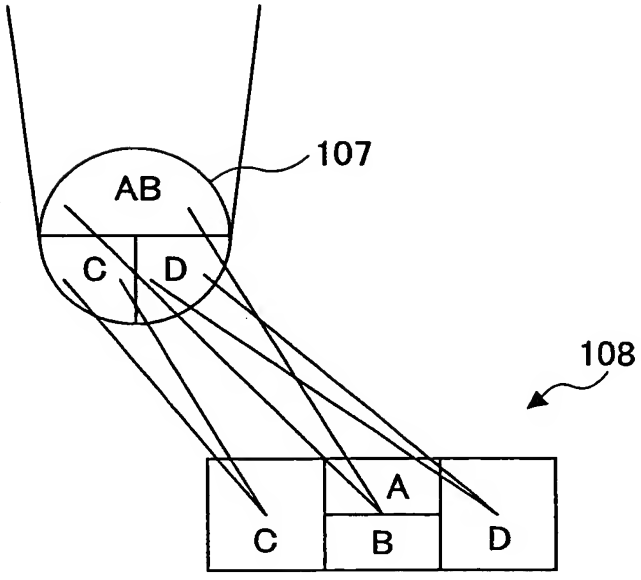

FIG.51B

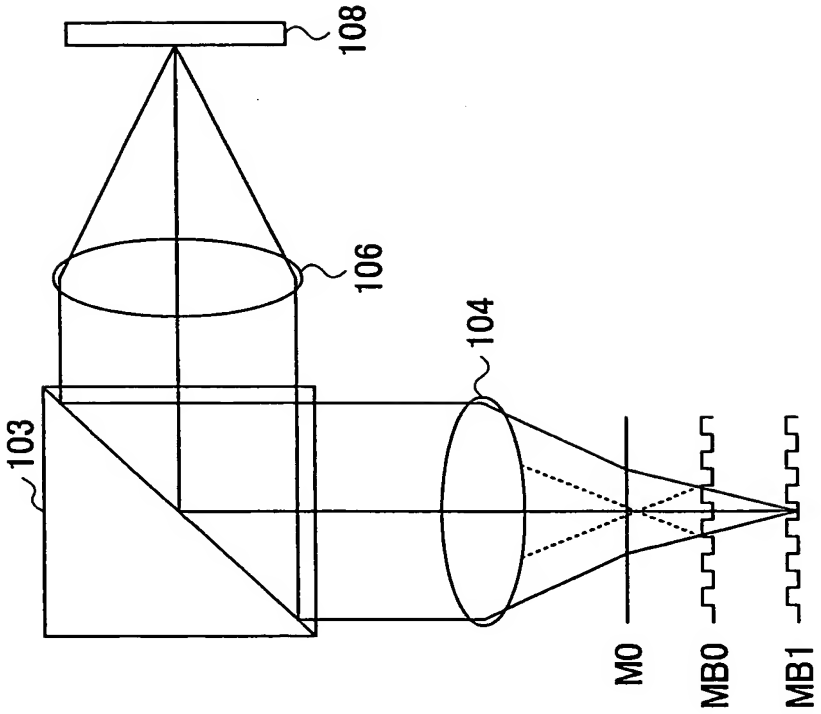

FIG.51A

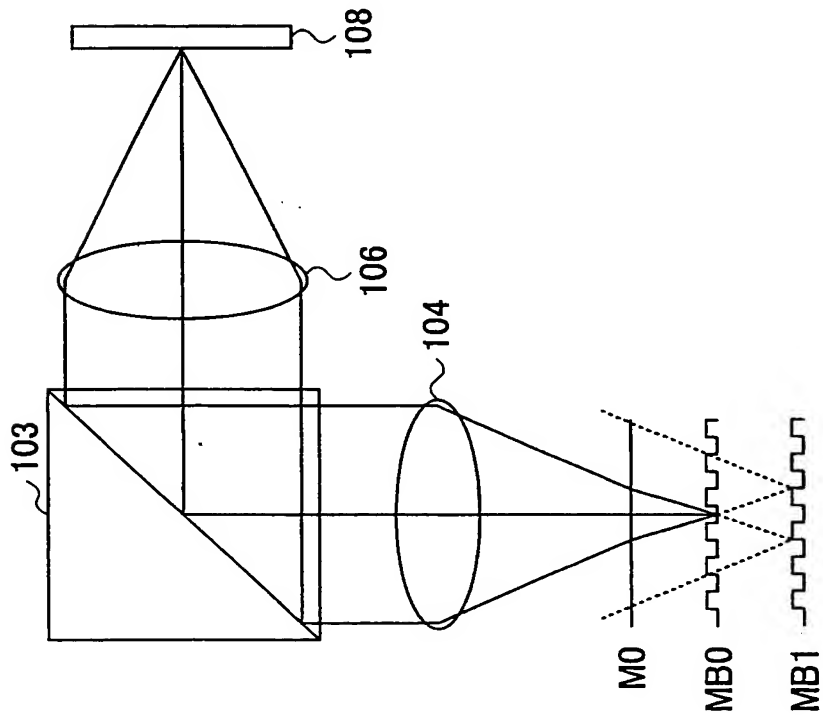

FIG.52

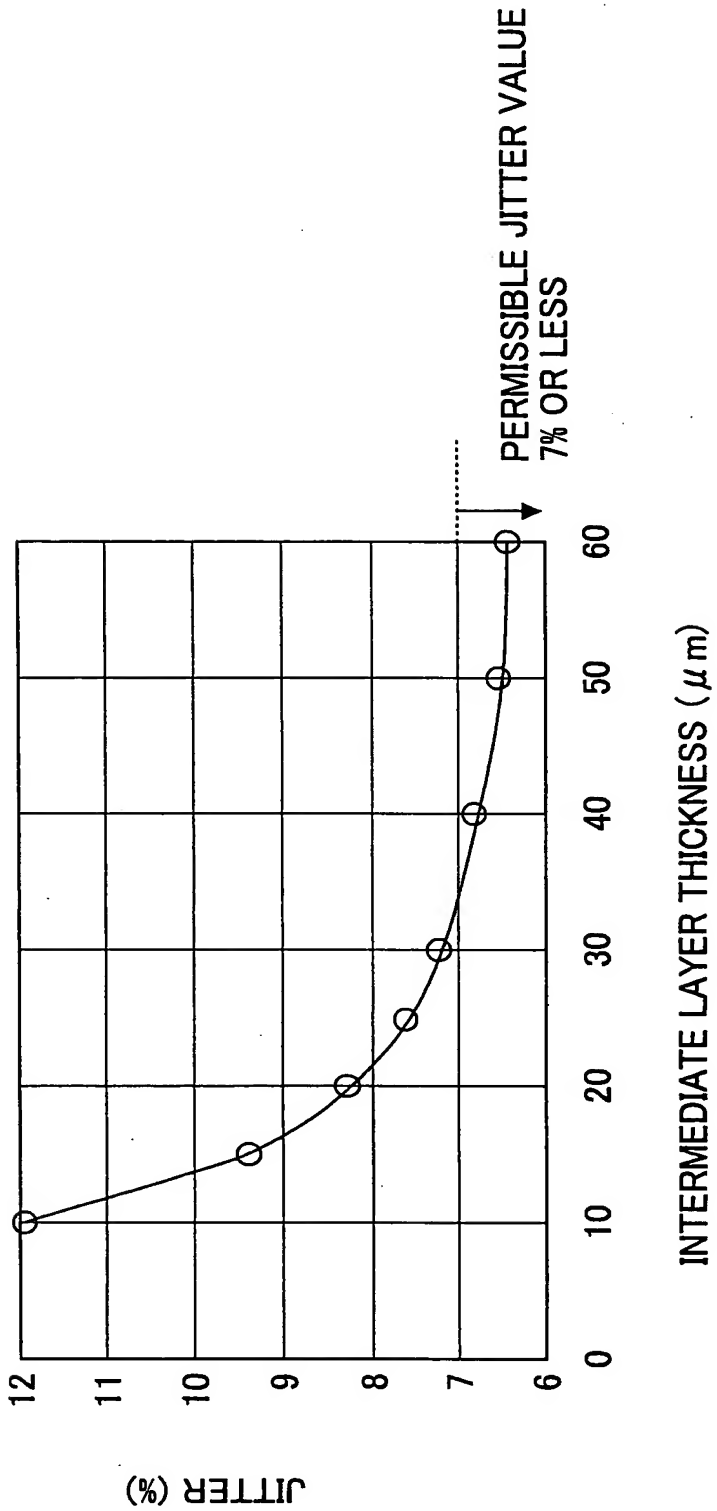
JITTER (%)
12
11
10
9
8
7
6
0
10
20
30
40
50
60
INTERMEDIATE LAYER THICKNESS (μm)
PERMISSIBLE JITTER VALUE
7% OR LESS

FIG.53A

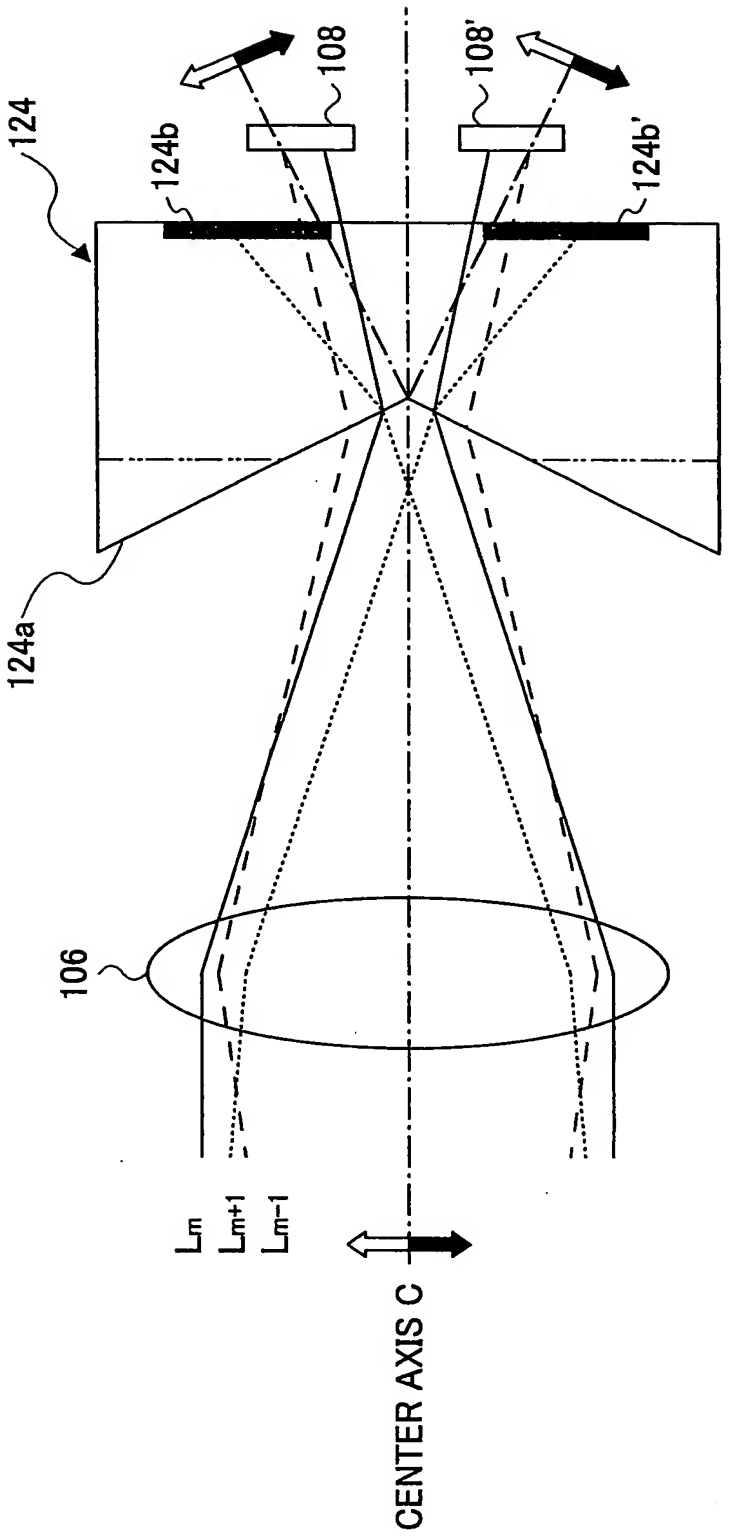

FIG.53B